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Progress in the Prevention and Control of Air Pollution in 1976

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PROGRESS IN THE PREVENTION AND CONTROL OF AIR POLLUTION IN 1976

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OF THE ENVIRONMENTAL PROTECTION AGENCY
To The
CONGRESS OF THE UNITED STATES
In Compliance with
SECTIONS 313, 202 and 306(e)
Of
PUBLIC LAW 91-604
THE CLEAN AIR ACT, AS AMENDED

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Section 313 of the Clean Air Act requires the Administrator of EPA to report yearly on measures taken toward implementing the purpose and intent of the Act. This report covers the period January 1 to December 31, 1976, and describes the issues involved in the prevention and control of air pollution and the major elements of progress toward that goal that have been made by EPA since the last report. In addition, for the first time, two other EPA reports to Congress required by the Clean Air Act as amended have been included:

1. Section 202 report on measures taken in relation to motor vehicle emission control (Chapter VII); and
2. Section 306(e) report on Federal procurement and violating facilities (in Chapter IX).

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CONTENTS

Page

LIST OF TABLES iv

LIST OF FIGURES vi

PREFACE vii

I. INTRODUCTION AND SUMMARY. 1

II. AIR QUALITY TRENDS 11

Suspended Particulate Trends 12
Sulfur Dioxide Trends 14
Carbon Monoxide Trends 15
Oxidant Trends 16
Nitrogen Dioxide Trends 16
Air Monitoring Strategy Review 17

III. DEVELOPMENT OF AIR QUALITY CRITERIA AND STANDARDS 19

Introduction 19
Health Effects Research 20
Ecological Effects Research 26

IV. STATUS OF STATE IMPLEMENTATION PLANS (SIPs) 29

Introduction 29
Revisions for Attainment/Maintenance 30
New Source Review 36
Transportation Control Measures 38

V. INTERGOVERNMENTAL RELATIONS 44

Federal Support of State and Local Programs 44
Interagency Cooperation 54
International Collaboration in Control of
Air Pollution 60

CONTENTS (continued)

Page

VI. CONTROL OF STATIONARY SOURCES 65

New Source Performance Standards. 65
Control of Hydrocarbon Emissions. 68
111(d) Standards. 70
National Emission Standards for Hazardous Air Pollutants (NESHAPS). 72
Registration of Fuels and Fuel Additives. 73
Development of New and Improved Air Pollution Control Techniques for Stationary Sources 73
Sulfur Oxides 74
Nitrogen Oxides (NO_x) 76
Particulates. 77
Other Pollutants. 78

VII. CONTROL OF MOBILE SOURCE EMISSIONS. 80

Introduction. 80
Measures Taken To Implement Mandated Title II Emission Standards. 80
Motor Vehicle Emission Regulations -- Actions Taken In 1976 86
Auto Fuel Economy Regulations 90
Cost of Meeting Emission Standards. 91
Emissions from Vehicles in Use 96
Assessment of Mobile Source Technology 99

VIII. RESEARCH IN MONITORING INSTRUMENTATION AND QUALITY ASSURANCE 105

Monitoring Developments 105

IX. ENFORCEMENT 112

Stationary Source Enforcement 112
Mobile Source Enforcement 128
Federal Procurement and The List of Violating Facilities. 136
Compliance by Federal Facilities. 140

CONTENTS (continued)

Page

X. LITIGATION IN 1976 142

Transportation Control Plans 142
Lead Pollution 143
New Source Performance Standards 143
Prevention of Significant Deterioration (PSD). 144
State Control Over Federally-Owned Pollution Sources . . 144
EPA Authority to Require Stringent Measures to
  Achieve Health Standards 144
Enforcement and Economic and Technological Infeasibility 145
Pre-Enforcement Review 146
Tall Stacks and Supplementary Control System 146
References 147

LIST OF TABLES

Table		Page
II-1.	National Summary of Air Monitoring Stations Reporting Violations of Air Quality Standards (1975)	11
II-2.	National Trend - Percent of Population Exposed to Annual Mean Total Suspended Particulate in Excess of 75 ug/m^3 (NAAQS) From 1970 Through 1974 -- Based On A Population At Risk of 164 Million	13
II-3.	Number of People Living In Areas of the New York-New Jersey-Connecticut AQCR Which Exceeds the Annual TSP NAAQS	13
IV-1.	National Attainment/Non-attainment Status of AQCRs and State Portions	31
V-1.	Organizational Location of State and Local Control Agencies Receiving Federal Funds	45
V-2.	Distribution of Funds by Jurisdictional Areas of State and Local Control Agencies	46
V-3.	Estimated Man-years of Effort Employed By State and Local Air Pollution Control Agencies	49
V-4.	Estimated Distribution of Resources Devoted to Air Pollution Control Activities of National Priority By State and Local Control Agencies in FY 75-76	51
V-5.	Attendance at Short-term Technical Courses	53
VII-1.	Emission Standards for Motor Vehicle Classes	84
VII-2.	Estimated Passenger Car Emission Control Equipment Costs, 1968-1980 Model Years	94
VII-3.	Estimated Per Vehicle Cost Penalties For Heavy-Duty Gasoline Engine Emission Control	92
VII-4.	Estimated Total National Costs for Mobile Source Emission Control, 1968-1985	94
VIII-1.	Ambient Air Quality Measurement Methods.	109
VIII-2.	Stationary Source Measurement Methods.	110
IX-1.	Compliance Status of Class A Emitters by Region.	114

LIST OF TABLES (continued)

Table | Page

IX-2. Stationary Source Air Pollution Enforcement January 1976 Through September 1976 115

IX-3. Stationary Source Air Enforcement Actions Initiated by EPA Regions January 1, 1976 Through September 30, 1976 116

IX-4. Status of Compliance with Emission Limitations--Major Pollution Steel Processes vs All Major Stationary Source Installations, September 1976. 123

IX-5. Mobile Source Enforcement January 1, 1976 Through September 30, 1976. 137

LIST OF FIGURES

Figure Page

II-1. Sulfur Dioxide Trends--90th Percentile of the Annual Averages for Sulfur Dioxide Monitoring Sites by Geographical Region (1971-1975) 15

PREFACE

The Clean Air Act, as amended, authorizes a national program of air pollution research, regulation, and enforcement activities. This program is directed at the Federal level by the U. S. Environmental Protection Agency (EPA). However, primary responsibility for the prevention and control of air pollution at its source rests with state and local governments. EPA's role is to conduct research and development programs, set national goals (via standards and regulations), provide technical and financial assistance to the states, and, where necessary, supplement state implementation and enforcement programs.

Section 313 of the Clean Air Act requires the Administrator to report yearly on measures taken toward implementing the purpose and intent of the Act. Section 313 reads as follows:

> "Not later than six months after the effective date of this section and not later than January 10 of each calendar year beginning after such date, the Administrator shall report to the Congress on measures taken toward implementing the purpose and intent of this Act including, but not limited to, (1) the progress and problems associated with control of automotive exhaust emissions and the research efforts related thereto; (2) the development of air quality criteria and recommended emission control requirements; (3) the status of enforcement actions taken pursuant to this Act; (4) the status of State ambient air standards setting, including such plans for implementation and enforcement as have been developed; (5) the extent of development and expansion of air pollution monitoring systems; (6) progress and problems related to development of new and improved control techniques; (7) the development of quantitative and qualitative instrumentation to monitor emissions and air quality; (8) standards set or under consideration pursuant to title II of this Act; (9) the status of State, interstate, and local pollution control programs established pursuant to and assisted by this Act; and (10) the reports and recommendations made by the President's Air Quality Advisory Board."

This report covers the period January 1 to December 31, 1976, and describes the issues involved in the prevention and control of air pollution and the major elements of progress toward that goal that have been made by EPA since the last report. In addition, for the first time, this report also includes two other EPA reports to Congress required under the Clean Air Act, as amended:

1. Section 202 report on measures taken in relation to motor vehicle emission control (Chapter VII); and

2. Section 306(e) report on Federal procurement and violating facilities (in Chapter IX).

I. INTRODUCTION AND SUMMARY

This report reviews the progress that the U.S. Environmental Protection Agency (EPA) has made during 1976 in the control and prevention of air pollution. The topics covered in the report are set forth in sections 313, 202, and 306(e) of the Clean Air Act. The major events which took place during 1976 are grouped by topic and briefly summarized here. They are discussed much more fully in the text of the report.

AIR QUALITY TRENDS

Suspended Particulate

Trends in total suspended particulates (TSP) levels since 1971 show a general improvement at a rate of four percent per year, resulting in 33 percent fewer people in the U.S. being exposed to levels higher than the health-related air quality standard. Improvement rates have differed in various parts of the country, with higher rates being found in the northeast and Great Lakes areas and more level rates in some western states. Approximately 30 percent of the nation's population are still living in areas above the long-term annual standard.

Sulfur Dioxide

Levels of sulfur dioxide (SO_2) in the air over the nation's urban areas have decreased by an average of 30 percent from 1970 to 1975. Most of this improvement took place during the 1970-73 period. Since then levels have been fairly constant because many areas have implemented control regulations and attained the ambient air quality standard.

From a national viewpoint, the urban SO_2 problem has diminished and only a small number of areas now exceed the air quality standard for SO_2. However, a number of major point sources of sulfur dioxide located outside of urban areas continue to hamper final achievement of the National Ambient Air Quality Standards (NAAQS).

Carbon Monoxide

Carbon monoxide (CO) levels have not been measured at as many locations and for as long a period of time as particulates and SO_2. Accordingly, it is difficult to determine with a reasonable degree of confidence national ambient air trends for CO. Where CO has been monitored a downward trend has been noted. An improvement in CO levels of about five percent per year was found.

Oxidant

No National trends can be reported at this time because of a lack of air quality trends. The widespread extent of the problem is reflected in that control strategies for 122 of the 247 air quality control regions (AQCRs) were found to be substantially inadequate and revisions to state plans are required. Moreover, 75 percent of the oxidant monitoring stations exceeded the one hour oxidant standard in 1975.

Nitrogen Dioxide

Nitrogen dioxide (NO_2) level trends vary geographically. Recent declines have occurred in three cities in northeast New Jersey and in one western city. No significant trend was found in the two other cities examined.

DEVELOPMENT OF AIR QUALITY CRITERIA AND STANDARDS

Since the initial publication of air quality criteria and the promulgation of ambient air quality standards for TSP, sulfur oxides (SO_x), hydrocarbons (HC), photochemical oxidants, and nitrogen oxides (NO_x), EPA has continued to support research which provides a current basis for reevaluation of the present criteria and ambient air quality standards. This research effort will culminate in the provision of preliminary updated and revised criteria documents for the above pollutants within the next three years. The first revised document, that for photochemical oxidants and HC, is scheduled for availability by mid-1977.

Other research continues to establish the basis for assessing the health and welfare impact significance of transportation related pollutants, trace metal pollutants, potentially toxic and hazardous chemical pollutants, and secondary pollutants formed in atmospheric reactions.

Special attention has been directed since March 3, 1976, toward the reevaluation and documentation of information related to the health effects of lead. The agency plans to propose NAAQS for lead by August 1977.

STATUS OF STATE IMPLEMENTATION PLANS

During 1976 EPA called for major revisions to State Implementation Plans (SIPs) in areas where the present plan is inadequate to provide for attainment of NAAQS. There were a total of 246 calls for SIP revisions, each call being specific to an AQCR or state portion and a criteria pollutant. These calls were the culmination of a major effort by EPA and the states to identify AQCRs experiencing violations of the standards and to ascertain the reasons for those violations.

The most widespread problems are those associated with photochemical oxidants and particulates. There were 114 calls for oxidant SIP revisions. The analysis which went into the calls as well as many other studies indicate that, with present technology, the oxidant standard may not be reached in many areas. However, reductions are possible. For TSP there were 78 calls for SIP revisions. Many of the calls involved both fugitive dust and fugitive emissions. Regulations for these types of sources will be difficult to develop. However, the TSP standard is attainable in most areas.

Also during 1976, EPA and the states placed more emphasis on developing and implementing New Source Review (NSR) procedures. NSR ensures that new sources meet all applicable emission limits and do not interfere with attainment/maintenance of the NAAQS or Prevention of Significant Deterioration (PSD) increments.

INTERGOVERNMENTAL RELATIONS

The Clean Air Act of 1970, as amended, places emphasis on the Federal support of state and local air pollution control programs. In 1976, 55 state and territorial agencies and 235 local agencies, working in coordination with the states, expended approximately $157 million and 7,100 man-years to carry out the major regulatory and enforcement aspects of the air pollution control effort.

Expanded activities undertaken pursuant to the requirements of the Act, Congressional guidance, and court orders have increased the importance and necessity for intergovernmental cooperation. EPA continues to delegate to the states increasing responsibility for administration of programs addressing national emission standards for hazardous air pollutants (NESHAPS), new source performance standards (NSPS), and prevention of significant deterioration (PSD).

Air pollution control programs which identify the need for controls more properly administered and enforced by state and local agencies other than air pollution control agencies have encouraged EPA to initiate efforts at the Federal level to establish interagency cooperation agreements. Agreements and cooperation efforts have been established with the Department of Transportation, Department of Housing and Urban Development, Federal Energy Administration, Department of Interior, and the Department of Commerce.

International cooperation continues in the form of EPA providing aid to specialized international organizations such as the Organization for Economic Cooperation and the United Nations Environment Program in the fields of monitoring and evaluation of the long range transport of air pollutants and the development of international air quality criteria for SO_x and TSP.

In addition to international cooperation through organizations such as the United Nations, EPA has entered into specialized bilateral air pollution projects with Canada, Mexico, Japan, the Federal Republic of Germany, the USSR, Spain, Yugoslavia, and Poland.

CONTROL OF STATIONARY SOURCES

Standards and Regulations

NSPS were promulgated for primary copper, zinc, and lead smelters, coal preparation plants, ferroalloy production facilities, and primary aluminum reduction plants in 1976. NSPS were also proposed for kraft pulp mills, petroleum refinery sulfur recovery plants, and lignite-fired steam generators.

During 1976 emphasis has been shifted towards control of emissions of non-methane HC, including petroleum production, refining, storage, and transfer operations; organic chemical manufacturing; and end-use applications, such as surface coatings and degreasing operations. Where feasible and practical, NSPS will be developed.

A NESHAPS was promulgated for vinyl chloride.

Research efforts for improved air pollution control techniques have emphasized flue gas desulfurization, removal of pollutants from fuels and the fluidized bed combustion process for SO_x; combustion modification and flue gas treatment for NO_x; fine particle control; and other pollutants, particularly trace metals, polycyclic organic matter, HC, and fluorides.

CONTROL OF MOBILE SOURCE EMISSIONS

The major element of the control of mobile source emissions has been EPA's Federal Motor Vehicle Control Program (FMVCP). During 1976 EPA tested for certification purposes 1977 model year vehicles. This required testing vehicles from 50 manufacturers and involved running approximately 2,900 emission tests.

By mid-1976 EPA began to accept applications for certification for 1978 model year vehicles. However, because of the general inability of most 1978 model year light duty vehicles to meet the 1978 statutory emission standards, EPA informed the industry that,while it would continue its certification testing of 1978 model year vehicles, it would not issue 1978 Certificates of Conformity for cars that did not meet the statutory 1978 standards.

During 1976 EPA promulgated emission standards for motorcycles which would be applicable beginning with 1978 model year vehicles. Emission regulations covering light duty trucks were revised by expanding the light duty class definition and by increasing the stringency of the emission standards applicable to light duty trucks beginning with the 1978 model year. More stringent evaporative emission regulations for light duty passenger vehicles and trucks were promulgated and made applicable beginning with 1978 model year vehicles. Proposed rulemaking was issued to increase the stringency of exhaust emission standards for heavy duty gasoline and diesel powered vehicles beginning with the 1979 model year.

Regulation of aircraft emissions came in the form of promulgated emission limitations for SST aircraft manufactured after January 1, 1980, and an increased emission limitation for aircraft manufactured after January 1, 1984. Regulation of the JT3D jet aircraft engine was revised by extending the effective date of the smoke emission standards from January 1978 to September of 1981 with an interim compliance date set for September of 1980.

EPA's FY 74 Emission Factor (Testing) Program completed in 1976 was the most comprehensive and representative to date. A random sample of 2,000 in-use vehicles was emission tested in an as received condition. The program included the first testing of in-use 1975 model year cars. The results of the testing indicated a general failure of relatively new cars to meet FMVCP emission standards and established the basis for EPA to encourage the industry to take "aggressive new action" to rectify the in-use vehicle emission standards compliance problem identified. In addition,EPA embarked on a further study of the failure of '75 model year vehicles to meet the emission standards. The study is designed to establish the efficiency of restorative maintenance programs in correcting emission standards compliance problems of in-use vehicles.

EPA research and evaluation of current technology indicates that motor vehicle emission controls will continue to rely heavily on the use of catalyst systems, especially in light of fuel economy gains possible with their utilization. More distant in the future is the expected increased use of all electronic control of engine parameters such as ignition and fuel metering. Other research is directed at characterizing and identifying potential problems associated with non-criteria pollutants from automotive exhaust emissions such as platinum, polynuclear aromatics, and hydrogen cyanide (from three-way catalysts). The environmental significance of changes in motor vehicle fuel composition is also under study.

RESEARCH IN MONITORING INSTRUMENTATION AND QUALITY ASSURANCE

Stationary Sources Emission Measurement

Monitors to measure chlorinated hydrocarbons from solvent degreasing and commercial dry cleaning facilities, hydrogen sulfide in refinery fuel gas lines, and sulfuric acid mist have been developed and tested. Previously developed monitors for NO_x and SO_2 were successfully field tested at nitric acid and sulfuric acid plants, respectively.

Mobile Source Emissions Measurement

Sampling and analytical procedures for SO_2 and sulfuric acid emissions from cars equipped with oxidation catalysts have been evaluated and standardized. New methods to measure HC emissions from passenger cars have been developed. New techniques have been developed to study the emissions of harmful pollutants associated with catalyst technology, including hydrogen cyanide, hydrogen sulfide, nitrosamines, nitrous oxide, and polynuclear aromatic HC.

Ambient Air Measurement

A new analytical technique has been used successfully to measure sulfates and nitrates. Research has continued on application of gas chromatography/mass spectrometry for measuring trace concentrations of organic vapors, use of the dichotomous samples to selectively sample for fine particles, and use of an improved device to measure low levels of airborne sulfuric acid mist.

EPA Reference and Equivalent Methods/Quality Assurance

Amendments have been proposed to replace the original NO_2 reference method with a new reference measurement principle and its associated calibration procedure.

Eight ambient air quality measurement methods have been tested and seven others are under review. Thirteen stationary source measurement methods for eight types of sources have been tested while nine others for nine types of sources are under review.

ENFORCEMENT

Stationary Source Enforcement

Enforcement of standards at stationary sources has focused on the 21,930 major emitters which account for about 80 percent of all air pollution from conventional stationary point sources. By July 1, 1976, EPA and the states had brought 19,833 of them into compliance or placed them on enforceable schedules leading to compliance in the near future. Compliance levels have climbed from 84 percent to about 90 percent during FY 1976. In the past six months EPA has taken 395 enforcement actions and completed 4,079 investigations, including plant inspections, opacity observations, emission tests, and formal inquiries for evidence.

States report that in the last six months they have conducted over 87,000 investigations of compliance status and have taken 9,771 enforcement actions, including 7,081 notices of violation and 2,690 enforcement orders or civil/criminal actions.

Despite all of this enforcement activity, 1,611 major sources still violate emission limits or compliance schedules and nearly 600 must be inspected to determine their compliance status.

Mobile Source Enforcement

EPA conducted 62 inspections and investigations of auto manufacturers resulting in 12 written inquiries and 1 prosecution referral.

EPA conducted 25 investigations of tampering with vehicle emission control systems which resulted in 6 prosecution referrals.

Twenty-eight investigations have led to 1 EPA ordered recall of 33,000 vehicles and 12 manufacturer initiated recalls of 620,000 vehicles.

There were 33 investigations of imports resulting in 1 prosecution referral, modification of 1,200 vehicles, export of 75 vehicles, and assessment of $760,000 in civil penalties.

In 1976, there were 23,400 service station inspections for lead content in fuels. As a result, 3,125 warnings were issued, 536 complaints were filed and $186,325 in civil penalties were assessed.

Federal Procurement and the List of Violating Facilities

The first three facilities to be listed under Section 306 of the Clean Air Act were named in 1976 for continuing noncompliance with clear air standards. These facilities, by being listed, are ineligible for use in a Federal contract, grant, or loan.

LITIGATION

There were several important court decisions in 1976. Among these were:

1. a decision by the Court of Appeals for the D.C. Circuit that, in circumstances where certainty is not possible, EPA may base its regulatory decisions on prudent policy judgments where factual analysis cannot provide definite answers;
2. a decision by the Court of Appeals for the Second Circuit to uphold a lower court decision that EPA develop a NAAQS for lead;
3. a decision by the Court of Appeals for the D.C. Circuit upholding EPA regulations for PSD; and,
4. a Supreme Court decision that Federal facilities must comply with state substantive requirements but not with state procedural requirements.

II. AIR QUALITY TRENDS

The status of air quality with respect to the national standards in 1975 was in many respects similar to that reported in 1974. (It should be noted that data used in this chapter will be the latest available. However, due to the time required to analyze and statistically interpret raw data, the values used may be for 1974 or 1975.) About the same percentage of reporting stations are exceeding the air quality standards. This is shown in Table II-1. Although the number of stations reporting violations has

Table II-1. NATIONAL SUMMARY OF AIR MONITORING STATIONS REPORTING VIOLATIONS OF AIR QUALITY STANDARDS (1975)

Pollutant	Standards Exceeded	Percent of Stations Exceeding Standards
TSP	Annual secondary	35
	Annual primary	18
	24 hour primary	6
	24 hour secondary	27
SO_2	Annual primary	<1
	24 hour primary	<2
	3 hour secondary	1
CO	1 hour primary	<1
	8 hour primary	6
O_x/O_3	1 hour primary	79
NO_2	Annual primary	3

Note: Valid annual data record must contain at least five of the scheduled 24 hour samples or 75% of possible values in all 4 quarters. Minimal data consist of at least three 24-hour samples or 400 hourly values.

remained fairly constant, the frequency of violations of standards at these stations or the highest values recorded have generally declined indicating that progress is being made in reducing pollutant levels.

Progress has been made in achieving compliance with the National Ambient Air Quality Standards (NAAQS) for total suspended particulate (TSP), sulfur dioxide (SO_2), and carbon monoxide (CO). Trends for nitrogen dioxide (NO_2) and photochemical oxidants are mixed. Progress is measured by comparing current data on ambient air pollution levels with past years for the primary and secondary NAAQS for each of the pollutants. (Primary standards protect the public health and secondary standards protect the public welfare, as measured by effects of pollution on vegetation, materials, and visibility.) Standards are further categorized by length of exposure/concentration level. Long-term standards specify an annual mean that may not be exceeded; short-term standards specify upper limit values for 1-, 3-, 8-, or 24-hour averages that may not be exceeded more than once per year.

SUSPENDED PARTICULATE TRENDS

Trends in TSP levels since 1971 show a general improvement at a rate of four percent per year, resulting in 33 percent fewer people in the U.S. being exposed to levels higher than the health-related air quality standard. Improvement rates have differed in various parts of the country, with higher rates being found in the northeast and Great Lakes areas, and more level rates in some western states. Despite the improvements, TSP still remains a problem. Approximately 30 percent of the nation's population are still living in areas above the long-term annual standard as shown in Table II-2.

Table II-2. NATIONAL TREND - PERCENT OF POPULATION EXPOSED TO ANNUAL MEAN TOTAL SUSPENDED PARTICULATE IN EXCESS OF 75 $\mu g/m^3$ (NAAQS) FROM 1970 THROUGH 1974*

Year	Percent
1974	30
1973	32
1972	37
1971	43
1970	45

*Base population of 164 million for this analysis.

A study of the New York-New Jersey-Connecticut AQCR shows that in 1971 58 percent of the total population lived in areas where levels exceeded the health-related standard. But, by 1974, this had dropped to 17 percent as shown in Table II-3.

Table II-3. NUMBER OF PEOPLE LIVING IN AREAS OF THE NEW YORK-NEW JERSEY-CONNECTICUT AQCR WHICH EXCEEDS THE ANNUAL TSP NAAQS.*

Population Category	Total Population in Millions	1971	1974	Percent reduction in population exposed to levels above annual primary TSP NAAQS
		Percent of Category Population	Percent of Category Population	
Total Population	17	58	17	71
School Age	3.9	53	14	74
Elderly	1.8	64	20	69

*The annual TSP NAAQS is 75 $\mu g/m^3$.

The numbers of those more likely to be adversely affected by high air pollution levels -- the elderly and the school aged -- living in the high pollution areas also dropped sharply. Although a slightly higher proportion of the elderly population lives in areas of elevated particulate levels, the overall rates of improvement are similar for the total population, for the school aged, and for the elderly.

SULFUR DIOXIDE TRENDS

Levels of sulfur dioxide in the air over the nation's urban areas have decreased by an average of 30 percent from 1970 to 1975. Most of this improvement took place during the 1970-73 period. Since then, levels have been fairly constant because many areas had implemented control regulations and attained the ambient air quality standard.

In some few cases, there seem to have been slight increases during 1975 because of changes in fuel use patterns. In the western states, where SO_2 levels are low, there has been an increase because of a curtailment in the use of natural gas for industrial purposes. Similar increases can be expected in parts of the Northeast.

From a national viewpoint, the urban sulfur dioxide problem has diminished and only a small number of areas now exceed the air quality standard for SO_2. However, a number of major point sources of sulfur dioxide located outside of urban areas continue to hamper final achievement of the NAAQS.

The year-by-year changes in the SO_2 levels measured at all locations within different regional areas of the country are shown in Figure II-1. (The west is omitted because of insufficient information.) Levels in the northern regions, even though decreasing, remain higher than the other areas, in part because of emissions associated with space heating.

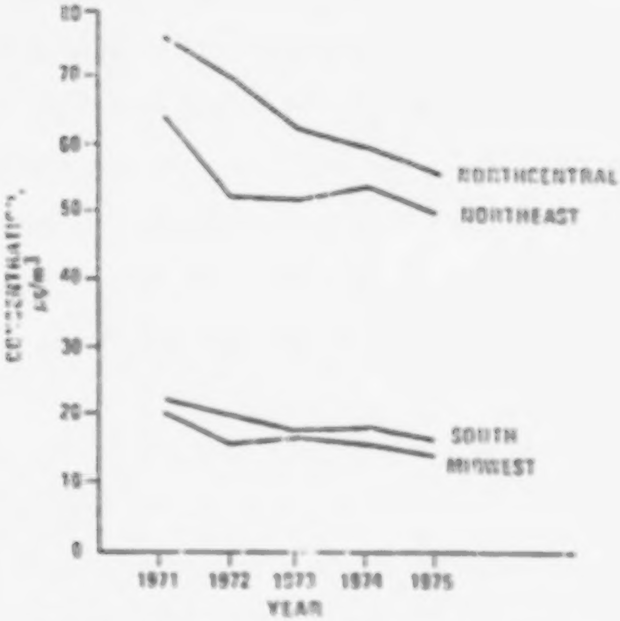

Figure II-1. Sulfur Dioxide Trends -- 90th Percentile of the Annual Averages for Sulfur Dioxide Monitoring Sites by Geographical Region (1971-1975).

CARBON MONOXIDE TRENDS

The primary source for emissions of carbon monoxide in most U.S. cities is the automobile. Nationally, three-fourths of the carbon monoxide comes from transportation sources. But, in some urban areas, transportation related sources can be responsible for as much as 99 percent of the emissions. Moreover, any city with heavy vehicular traffic may have a potential problem from carbon monoxide. In some cases, the problem may be highly localized -- affecting perhaps only a few street corners. In other cases, the problem may be widespread throughout the center-city area and near major commuter corridors. In any event, improvements in levels of carbon monoxide in the air will almost always be directly related to control of emissions from automobiles.

Generally, carbon monoxide levels have not been measured at as many locations and for as long a period of time as particulates and sulfur dioxide. Accordingly, it is difficult to determine with a reasonable degree of confidence national ambient air trends for carbon monoxide. Where carbon monoxide has been monitored a downward trend has been noted. In California, 81 percent of the CO monitors have shown a downward trend resulting in an overall improvement of about 7% per year. For the rest of the nation, an improvement in CO levels of about 5% per year was found.

OXIDANT TRENDS

Oxidants (or photochemical oxidants) are not emitted directly into the air from air pollution sources. This group of chemicals is formed in the air by chemical reactions between hydrocarbons -- such as gasoline vapors and cleaning solvents -- and nitrogen dioxides -- which are formed from the nitrogen and oxygen in the air whenever any kind of burning takes place.

During 1976, a major concern developed over the widespread violations of the national ambient standard for oxidants. Although no national trends can be reported at this point, an idea of the magnitude of the problem can be obtained from the number of State Implementation Plans found to be substantially inadequate with respect to oxidant (122 AQCRs out of a total of 247). Another indication of the widespread problem is that 79 percent of the oxidant monitoring stations exceeded the 1 hour primary standard in 1975 (see Table II-1). A lack of historical data prevents comparison with prior years.

NITROGEN DIOXIDE TRENDS

Nitrogen dioxide level trends vary geographically. A significant decline occurred in the Los Angeles Basin between 1971-1975, but in the San Francisco Bay Area as many sites increased as decreased. Recent declines have occurred in three cities in New Jersey and in Denver, Colorado. No significant trend for nitrogen dioxide was found in the two other cities examined, Chicago, Illinois, and Portland, Oregon.

Uniform Air Pollution Index Developed

A standard air pollution index for use by local governments, newspapers, radio and television stations, and other news media has been developed to provide nationwide uniformity in pollution readings and to increase public understanding. Adoption of the recommended index by Metropolitan and State Agencies is on a voluntary basis. The index was developed through the efforts of the Federal Task Force on Air Quality Indicators.

The index is designed to convert the maximum measured daily air pollution levels in a city to a simple number on a scale of 0 to 500. Intervals on this scale are related to the potential health effects of the daily measured levels of carbon monoxide, oxidants (or ozone), particulates, sulfur dioxide, and nitrogen dioxide. The air pollution intervals and their health effects terms range from "good" (0 to 50), "moderate" (50 to 100), "unhealthful" (100 to 200), "very unhealthful" (200 to 300), to "hazardous" (above 300). An index value of 100 corresponds to the short period National Ambient Air Quality Standards and 500 corresponds to the "significant harm" level established by EPA for the protection of human health. Index values of 200, 300, and 400 correspond to the established Federal episode criteria which local agencies use as administrative guides for taking emergency control actions.

AIR MONITORING STRATEGY REVIEW

In October 1975, a Standing Air Monitoring Work Group was established to review air monitoring activities and develop an overall strategy for future air monitoring. The group was formed because air monitoring data needs to meet program objectives are dynamic and vary considerably between Federal, state, and local control agencies. The Work Group was to be a partnership effort between the EPA, states, and local control agencies and the strategy evolved was to assure collection of necessary and accurate air quality data within the present and foreseen level of resources allocated by Federal, state, and local levels of government.

In 1976, a series of nine air monitoring issue papers were cooperatively prepared by the Work Group and widely circulated to state and local agencies for comment and review. Based upon the reviews and comments a draft overall air monitoring strategy document was completed in December 1976. A series of workshops for state and local agencies is scheduled for early 1977 to critically review the monitoring strategy document. The revised document will be used to prepare future monitoring guidance documents and assist in evaluating and revising future air monitoring activities.

III. DEVELOPMENT OF AIR QUALITY CRITERIA AND STANDARDS

INTRODUCTION

Air quality criteria documents were issued for particulate matter, sulfur oxides, hydrocarbons, photochemical oxidants, carbon monoxide, and nitrogen oxides in the period January 1969 through January 1971. On April 30, 1971, (36 FR 8186) subsequent to issuance of the criteria, EPA established primary and secondary National Ambient Air Quality Standards (NAAQS) for these pollutants.

On September 14, 1973, EPA revised the standards by revoking the annual secondary standard for sulfur dioxide and revising the Air Quality Criteria for Sulfur Oxides. In addition, the maximum 24-hour concentration published as a guide for implementation plan development purposes was deleted.

The above revisions to the criteria and standards have to date been the only changes to the Federal criteria and standards. Thus, the air quality goals which form the basis for State Implementation Plans (SIPs) have for the most part not presented a moving target for SIP development purposes. Phased reevaluation of the criteria and NAAQS (in addition to that provided under §307 of the Act) is, however, a policy early espoused by EPA and finds its rationale in the Clean Air Act's guidance, §108(a)(2), which states that "Air quality criteria for an air pollutant shall accurately reflect the latest scientific knowledge useful in indicating the kind and extent of all identifiable effects on public health or welfare which may be expected from the presence of such pollutant in the ambient air, in varying quantities." (emphasis added)

Work presently underway is directed at providing preliminary updated and revised criteria documents for the six original pollutants during the next three years. The first document in the revision sequence, the photochemical oxidants document, which combines the previous oxidants and hydrocarbons criteria documents, is scheduled to be ready by late 1977.

In addition to the criteria revision work in progress, EPA,as a result of litigation initiated by the Natural Resources Defense Council and a court order issued March 1, 1976, listed lead (Pb) under §108(a)(1) of the Act as a pollutant for which air quality criteria must be established pursuant to §108(a)(2) of the Act. EPA appealed, and on November 10, 1976, the appellate court affirmed the decision of the lower court. EPA, as a result of the appellate court decision, will propose NAAQS for lead by August 10, 1977.

HEALTH EFFECTS RESEARCH

Research Approach

Research on health effects is fundamental to the Agency's responsibility and ability to develop criteria and to promulgate and enforce standards and guidelines. EPA health effects research is specifically designed to identify pollutants which may pose a risk to health, to quantify the relationships between exposure to those pollutants and their effects on health, and to document the benefits of reducing or eliminating human exposure through pollution control.

In the health effects research program, data bases are developed for determining whether restricting exposure to particular pollutants is necessary to protect public health and, if so, to what degree exposure should be restricted. To do this, a combination of research approaches is used: toxicological studies which utilize animal models, human clinical studies, and epidemiological studies of human populations in their actual environmental settings.

The health effects research program is basically divided into four pollutant areas: studies on criteria pollutants, non-criteria pollutants, pollutants associated with transportation activities, and non-pesticide organic and inorganic substances.

Criteria pollutants are those for which National Ambient Air Quality Standards (NAAQS) have been set: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (TSP), hydrocarbons (HC) and photochemical oxidants (Ox). The Agency is continuing to obtain health effects information on these pollutants in several areas, such as exposure averaging times--that is, short-term, high-concentration exposure versus long-term, low-level exposure, the adequacy of existing safety margins, the health benefits of meeting the standards, and the health risks of exceeding the standards. Thus, the research in this area is basically directed toward expanding the health data base for those pollutants for which NAAQS have been promulgated and refining the criteria on which those standards are based. Any evaluation and adjustment of the standards which may prove to be necessary will be influenced substantially by these data.

Studies are also being conducted in the criteria pollutant area to identify populations most at risk, to refine exposure-effects data for such populations, and to determine the effects of exposure to combinations of the criteria pollutants.

Non-criteria pollutants are those for which no NAAQS have been established. Health effects research is also directed toward developing data on these pollutants, e.g., sulfates, nitrates, and respirable particulates. Some existing evidence associates these pollutants with harmful effects on human health. Questions being posed in this regard include determination of exposure-response relationships for these pollutants, both by themselves and in combination with other pollutants.

One particular area of research in air pollution relates to transportation. The purpose of this program is to develop comprehensive toxicological and epidemiological data bases on the public health consequences of pollutants stemming from transportation sources. EPA is conducting a series of studies to ascertain health risks associated with emission products such as sulfuric acid, sulfates, carbon disulfide, hydrogen sulfide, palladium, platinum and aluminum oxide from vehicles equipped with catalytic converters. The effects of substances used as fuel additives are also being investigated, and plans to begin work on possible biological effects of diesel emissions have also been made.

Non-pesticide inorganic and organic substances are also topics of investigation in the air program area. The health program addresses a number of trace metals, including cadmium, copper, zinc, arsenic and lead. In assessing the health implications of exposure to such pollutants, two important questions being examined are the relative contribution of the various possible routes of exposure to observed health effects and the exposure-response relationships exhibited by these substances. Examples include population studies which were initiated in 1975 on the health impact of these metals in communities near primary smelters and the development of screening systems for rapid assessment of potentially hazardous biochemical activity.

Research Efforts

Criteria Pollutants - A monograph, "Health Consequences of Particulate Air Pollution," has been prepared. The document gives data collected in 1971 and 1972 from the southeastern U.S. and the New York City area on the relationships between particulate air pollution exposures and the prevalence of chronic respiratory illness, the incidence of acute respiratory illness, and the aggravation of symptoms in susceptible subpopulations. Results from the studies reported support the current standard for total suspended particulates and provide data that can be useful to future Agency actions relative to respirable particulates and suspended sulfates.

Decrements in certain lung function parameters following four-hour exposure to 0.4 parts per million (ppm) ozone and two hour exposure to 0.6 ppm ozone were observed in human subjects. This work will be used in continuing evaluations of the National Primary Ambient Air Quality Standards and the SIPs Recommended Federal Episode Criteria for photochemical oxidants. The above findings, together with other health effects parameters yet to be examined, are especially relevant to assessing the adequacy of the existing safety margin in the present ambient standard and the Episode Criteria.

Chromosomal aberrations were examined in college freshmen, half of whom had resided in Los Angeles, a high oxidant area, and half of whom had entered college from residences elsewhere in the U.S. No evidence was observed of a seasonal effect of oxidant air pollution on the frequency of aberrations. A constant excess of aberrations observed in the Los Angeles Basin residents is being examined. This work can expand our knowledge of the risks associated with high oxidant levels and will help to elucidate previous suggestions of radiation-like effects of oxidants (measured as ozone) on chromosomes.

An animal model, developed as part of the air health program, was used to assess the immune response or defense mechanism of the lung. It was shown that ozone and nitrogen dioxide in 0.1 ppm and 3.5 ppm concentrations respectively significantly enhance mortality and reduce mean survival time in mice challenged with streptococcus bacteria. Such findings contribute to the body of information on the effects of these pollutants on the ability to resist infectious disease, providing a firmer basis for regulatory decisions in the future.

To simulate natural air pollution conditions, animals were exposed to fluctuating concentrations of NO_2 over time, the fluctuations representing peak intermittent exposures. On such a regimen, followed by challenge with streptococcus bacteria, an increased mortality was observed in the exposed population. These findings contribute to an improved understanding of the relationship between concentration and duration of exposure in evaluating not only the concentration established by the air standards, but the averaging times employed as well.

An improved monitoring methodology system that is capable of measuring the exposure of selected populations to short-term, high levels of various air pollutants, such as SO_x and NO_x, was deployed. This system permits firsthand study of the relationships between the observed acute adverse health effects and the measured short-term, high pollutant levels. The combination of these data is used to assess the degree of protection provided to the public by current short-term exposure averaging times and to develop the data base for establishing new short-term standards.

Construction of the clinical health facility at the Research Triangle Park Health Effects Laboratory is nearing completion. These facilities will provide the capability to assess the effects on human health of specific pollutants by means of human exposure studies carried out under controlled laboratory conditions. In addition, work has been in progress to develop and apply non-invasive physiological techniques for human subjects. Two such techniques for sensitive measurements of cardiac parameters have resulted in an entirely new approach, for which EPA has applied for a patent.

Non-criteria Pollutants - A long-term study of animal exposure to mobile source pollutants was completed and analyzed. All exposed groups developed altered pulmonary function and structural pathologic changes. Pulmonary emphysema was present in several experimental groups. The results of the study are relevant to the continuing evaluation of the NAAQS and present mobile source emission standards.

Sample collection and analysis were completed in a pilot study conducted cooperatively with the Center for Disease Control. The study was designed to preliminarily assess trace metal body burden in residents of primary non-ferrous smelter communities. When analysis of results is complete, the information will be used as part of the basis for selecting smelter communities for a more in-depth trace metals health effects study.

A major effort has been directed toward developing and utilizing *in vitro* screening techniques for predicting the toxicity, mutagenicity, and carcinogenicity of numerous environmental pollutants. The screening systems developed are expected to be valuable in assessing the myriad of potentially hazardous substances presently found in the environment.

ECOLOGICAL EFFECTS RESEARCH

Research on ecological effects, i.e., effects on land life other than man, are fundamental to developing criteria and standards and guidelines relating to the welfare effects of environmental pollutants.

Research Efforts

Criteria Pollutants - It has been assumed by most researchers that long-term chronic SO_2 fumigations of conifers in their dormant period had no effect on plant growth. Preliminary estimates of a study to test this hypothesis indicate winter SO_2 fumigations do affect plant growth of one-year-old Douglas Fir and Ponderosa pine seedlings. A study is now under way to determine yield effects of short 3-6 hour SO_2 winter fumigations on winter wheat at different growth stages.

The northeastern portion of the United States consistently receives precipitation which is 10-100 times more acidic than the geologic average. Other areas are also impacted. The effects of this increase in the acidity of rain on terrestrial ecosystems are being studied. Simulated rain treatments at acidities ranging from values typical of Northeastern United States to those found in other areas of the United States are being applied for three hours, three days each week. Since sulfates in rain appear to be a major contributor to the acidic reaction, acidities are controlled by additions of sulfuric acid. Various responses are being evaluated. These include the leaching of chemicals from foliage and soil, the transport of nutrients, and plant productivity. Effects associated with decomposition processes, the germination and establishment of a wide variety of forest trees, and the growth of agronomic crops are also being examined. The relevancy of this research to the present NAAQS for SO_2, a precursor of sulfates, is noted.

Photochemical oxidant studies conducted on lettuce, table beets and red clover to determine yield effects at five different levels of ozone have been completed and are being analyzed. Results obtained from exposure seedlings of 9 western conifer species to an average of 10 ppm ozone for 6 hours per day for 20 weeks showed significant growth reductions (10-25 percent) in 2 species (ponderosa pine and western white pine).

Based on preliminary findings, considerable interest has developed in the measurement of ethylene evolution from plants as a sensitive indicator of pollution stress. Further work has shown that oxidizing pollutants such as ozone and chlorine gas act more effectively as ethylene generators than do sulfur dioxide and other non-oxidizing pollutants. Research on ethylene evolution will continue both from the standpoint of plant stress indicators and the natural emission of photochemical oxidant precursors.

Non-criteria Pollutants - Decomposition in the soil is an essential biological process in which dead organic matter is remineralized to plant nutrients. It is becoming increasingly apparent that human activities are affecting this important life support process. At least 12 toxic substances added at real world concentrations to soil microcosms were found to markedly decrease the decomposition process and to inhibit the reproductive capability of all soil invertebrates tested. The toxic substances include cadmium, selenium, cobalt, mercury, zinc, nickel, chromium, manganese, vanadium, lithium, lanthanium and silver. Further, research to determine effects of various concentrations and combinations of these substances and their relationship to other natural variables is in progress.

A study was completed on the uptake and translocation of cadmium from fertilizers by representative root, leaf and seed crops. While the transport route was by fertilizer rather than air, the results showed that cadmium uptake by radish, lettuce and peas grown on a coarse textured acid soil was a linear function of the Cd concentration. The percentage of Cd in fertilizer recovered in the plants was 5.3, 9.0 and 2.0 for the radish, lettuce and peas respectively. These uptakes may be of sufficient magnitude to be of biological significance to consumer organisms.

Uptake of Cd in fertilizer was also linear from a calcareous silt loam soil, but was much lower than from the acid sand. In these experiments, percentages of Cd recovered in the plants were 0.6 in radish and 0.8 in lettuce. Cd levels in peas grown on the calcareous soil were below the detection limit of the analysis procedures used.

In energy related research, preliminary analysis of field experiments in southeastern Montana are revealing a rather broad spectrum of effects (plant and animal) on the indigenous grassland ecosystem. It is too soon to determine whether these measured effects are reversible or persistent. The project is scheduled to continue through 1978.

IV. STATUS OF STATE IMPLEMENTATION PLANS (SIPs)

INTRODUCTION

Under the Clean Air Act, states were required to submit SIPs to EPA for approval in early 1972. Most of these SIPs were generally approved as demonstrating attainment of the standards by mid-75. (Some SIPs demonstrated attainment by mid-77 under the "two-year extension" provision, and others were unapprovable thereby requiring EPA promulgation.)

During the period mid-72 to mid-75, major SIP revisions were submitted infrequently; abatement activities concentrated on achieving compliance with the original regulations. Major revision efforts were generally restricted to (1) modifying SO_2 regulations which were more stringent than required to attain standards, (2) promulgating regulations to correct specific deficient provisions (e.g., transportation controls and control of non-ferrous smelters), and (3) Federal promulgations resulting from court decisions such as to prevent significant deterioration, review indirect sources, etc.

Since the attainment date for National Ambient Air Quality Standards (NAAQS) (May 31, 1975, for most states), EPA and the states have been engaged in an intensive effort to identify those areas not attaining standards and to ascertain the reasons for non-attainment. Preliminary assessments of the areas not expected to attain were given in a previous report of this series. A major part of the effort to ascertain the reasons for non-attainment was the effort to determine SIP "adequacy." Section 110(a)(2)(H)(ii) of the Clean Air Act as amended requires that SIPs provide "for revision, after public hearings, of such plan ... whenever the Administrator finds on the basis of information available to him that the plan is substantially inadequate to achieve the national ambient air quality primary or secondary standard which it implements" (emphasis added). On June 30, 1976, EPA issued calls for revisions to SIPs which were substantially inadequate to attain and maintain standards.

REVISIONS FOR ATTAINMENT/MAINTENANCE

Table IV-1 below summarizes EPA actions in calling for SIP revisions. An air quality control region (AQCR) can fall into one of four different categories: (1) Attaining NAAQS; (2) Non-attainment--SIP revisions needed for attainment/maintenance; (3) Attainment--SIP revisions needed for maintenance only; (4) Non-attainment--on-going compliance work or further study needed. The last category includes all those AQCRs where NAAQS were not attained but where current SIP regulations should be adequate for attainment once fully enforced. As can be seen from the table, total suspended particulates (TSP) and O_x are causing the greatest problems nationwide. The problems associated with these two pollutants are discussed in some detail below.

The pollutant-specific discussion below summarizes the findings of EPA and the states in determining SIP "adequacy." The calls for revisions on June 30, 1976, identify, insofar as possible, the underlying causes for non-attainment and the general type of regulations needed. In AQCRs where calls for attainment and maintenance were issued the state will have to revise the SIP to include, as needed to meet and maintain national standards, all achievable emission limitations by July 1, 1977. Any other controls needed to meet and maintain national standards (which may include transportation and land-use measures) must be submitted by the state by July 1, 1978.

Table IV-1. NATIONAL ATTAINMENT/NON-ATTAINMENT STATUS OF AQCRs AND STATE PORTIONS*

Status	TSP	SO_2	CO	O_x	NO_x
Attainment	124	256	233	143	308
SIP Revisions Needed for Attainment/Maintenance	78	12	41	114	1
SIP Revisions Needed for Maintenance Only	11	11	2	0	1
Non-Attainment--On-going Compliance Work or Further Study	100	34	37	56	3
Total	313	313	313	313	313

*The figure of 313 AQCRs and state portions of interstate AQCRs is used here rather than the figure of 247 AQCRs because some AQCRs overlap state boundaries. Different state portions of the same AQCR could therefore have a different attainment status.

Photochemical Oxidants

As can be seen in Table IV-1 over half of the AQCRs and state portions have not attained the ambient oxidant standard. The problems associated with attaining the oxidant standard are the most difficult currently being faced in the SIP process. The past year has been one of progress in EPA's understanding and study of the problems. This will form the basis of future control activities by EPA and state and local air pollution control agencies.

The widespread nature of oxidant violations is due, in part, to long-range transport of oxidant and its precursors (nitrogen dioxide and organics). Transport makes the control of oxidant more difficult in that violations of the standard in one area may be due to emissions in another. The control of oxidants has also been complicated by recent evidence showing that all non-methane hydrocarbons and many other organic compounds will react photochemically if given sufficient time. This means that regulations which required the substitution of less reactive compounds for the more highly reactive ones will have to be reevaluated. Although such regulations provide oxidant reductions in the immediate area where they are implemented, they may not be of great benefit over a wider region. In the future, stationary source regulations will need to focus on the reduction of all organic emissions,not certain classes.

The revision of inadequate O_x SIPs will involve both stationary source controls and land use/transportation controls. In the past, oxidant strategies have tended to focus on metropolitan areas. The June 30, 1976, calls for new oxidant strategies emphasized that controls will be needed in broader metropolitan areas and in adjacent areas of high population density. In some cases the strategies will involve statewide control of stationary sources. The writing of regulations for stationary sources of organics is a difficult task in that the technology involved is still relatively new and many control agencies have not had to implement them before. EPA is emphasizing the development of new control technologies in order to support the regulation development effort by the states. The control of transportation related emissions will continue to be difficult. These controls more directly affect the life style of citizens than any other air pollution control measure. Since the transportation measures control both oxidants and CO, they are discussed later in this chapter.

As a result of studies and the analysis behind the June 30 calls for revisions, it is clear that, with currently available control technology, the O_x standard will not be attained in many areas. In these areas the SIPs will need to be further revised periodically to include additional controls as technology improves and as new transportation and land-use measures become available.

Total Suspended Particulates (TSP)

The air has become measurably cleaner since the Clean Air Act amendment of 1970 and this is especially true for TSP. For the most part, the concentration of particulates in the ambient air has been steadily decreasing annually since 1970 through 1975. However, in several areas the air quality concentrations had begun to level off at concentrations in excess of the NAAQS and further evaluation of the problem was needed. During the past year, EPA has been evaluating these areas to determine what course of action would be necessary. In many cases the TSP problem has been determined to be one of merely the enforcement of existing regulations. Therefore, in a number of non-attainment areas it is believed that full compliance with existing requirements will provide the necessary reductions to attain the NAAQS and no revision to the existing plan is needed. However, in a number of other areas, it has been determined that the existing TSP plan is inadequate and that a plan revision will be necessary. In the recent call for plan revisions by EPA, approximately one-third were for TSP (See Table IV-1).

Basically, the existing plans address the problem of,and place their major emphasis on, the control of conventional sources of TSP. In many non-attainment areas the emphasis will continue to be stationary sources as further control of these sources will provide significant reductions in air quality levels.

However, in other areas, control of less conventional sources will be needed. When the implementation plans were developed with their major emphasis on stationary sources, emissions of fugitive dust from unpaved roads, fields used for agricultural purposes, natural windblown dust, mine tailings piles, resuspended dust from paved streets, and fugitive emissions were not generally taken into account and programs and regulations to reduce dust from such sources were generally not included specifically in the plans to control TSP. These sources of dust have been known to exist for some time, but no quantifiable estimates of the impact of such sources on air quality were available at the time of the original implementation plan development. Since that time, EPA and the states have become increasingly aware that the attainment and maintenance of the particulate standard may be adversely affected by both fugitive emissions and fugitive dust emissions. Fugitive emissions are generated from industrial operations and are released to the atmosphere through windows, doors, roof vents, etc., but not through the primary exhaust system. On the other hand, fugitive dust emissions result from the force of the wind or man's activity on the land. This latter category includes windblown particulate matter from crop land, unpaved roads, and exposed areas at construction sites, as well as particulate reentrained from streets by automobiles, action of the wind, etc. Both types of emissions are very difficult to quantify and, as a result, the relative magnitude of the problem is increased.

However, recently several studies have been conducted concerning total suspended particulates and the results have indicated an ever increasing impact due to fugitive emissions and fugitive dust emissions. As a result, the Agency has identified these emissions as significant sources of TSP which now must be addressed as part of the current revisions to the original SIPs due to be submitted in July 1977 and July 1978. Studies conducted in preparation of these plan revisions in non-attainment areas are frequently implicating resuspended road dust emissions as major factors affecting non-attainment. Traditional stationary source control has resulted in very significant improvements in air quality, but in addition to more stationary source control, the control of fugitive dust and fugitive emissions is also generally necessary to provide for attainment of national standards.

Other Pollutants

The number of SIP revisions needed for pollutants other than TSP and O_x is relatively minor. As Table IV-1 shows, the ambient standards for SO_2, CO and NO_x are being attained in the majority of AQCRs and state portions. For SO_2 there were 12 calls for attainment/maintenance revisions and these calls generally recommended additional point source controls. As discussed in Chapter II, SO_2 levels have generally been declining due to fuel switching. However, due to the energy crisis, there has been some switching back to high sulfur fuels. EPA has approved some 13 SIP revisions during the past year in situations where SO_2 regulations could be relaxed without endangering attainment of standards. There were calls for CO revisions in 41 AQCRs and state portions. These calls will necessitate further transportation controls. Finally, there was only one call to revise a NO_2 plan for attainment. However, continued surveillance will be necessary since expected stationary source growth may lead to future maintenance problems.

NEW SOURCE REVIEW

The control of pollutant emissions under the Clean Air Act can be divided into two parts, the control of stationary sources and the control of mobile sources. One of the major administrative control mechanisms affecting stationary sources is that of new source review. It assists states in the control of the location and amount of new pollutant emissions. In this respect new source review serves the same purpose for stationary sources as many transportation control measures provide for state control of mobile source emissions.

New source review affects both new sources and modifications to existing sources. It implements key sections of the Clean Air Act. They include Section 110 which protects ambient air, Section 111 which establishes new source performance standards, and Section 112 which establishes national emission standards for hazardous air pollutants.

In reviewing the location of new or modified sources, new source review safeguards ambient air standards. Such standards include the National Ambient Air Quality Standards and ambient air increments established to prevent significant deterioration of air quality. In this regard, the direct air quality impact of a source is at issue. Air quality assessment plays a significant role. By analyzing meteorology, topography and pollutant emission characteristics, air quality assessments predict the added burden that an individual source will place on near, and in some cases distant, air quality.

The air quality impact of a source is not directly at issue in all aspects of new source review. The use of new source review to implement Sections 111 and 112 of the Act concerns technology standards. Technology standards have also been established under Section 110 of the Act in order to protect ambient air standards. Currently, two programs affecting SIPs (established pursuant to Section 110) require technological standards.

In the EPA promulgated regulations to prevent significant air quality deterioration, the Administrator requires the application of "best available control technology" to any new source or source modification in clean air areas. The significant deterioration program applies only in those areas with ambient air cleaner than the national standards. The most stringent technology based standards apply to sources seeking to construct in areas not meeting national ambient air standards. These were established in a December 21, 1976, interpretive ruling.

That interpretive ruling addressed the issue of whether and to what extent national air quality standards established under the Clean Air Act may restrict or prohibit growth of major new or expanded stationary air pollution sources. The ruling provides in general that a major new source may locate in an area with air quality worse than a national standard only if stringent conditions can be met. These conditions are designed to ensure that the new source's emissions will be controlled to the greatest degree possible; that more than equivalent offsetting emission reductions ("emission offsets") will be obtained from existing sources; and that there will be progress toward achievement of the standards.

In all but six SIPs, EPA has approved the state's own preconstruction review regulation. The interpretive ruling will therefore be implemented largely by state and/or local reviewing authorities. Only in the six states where EPA has been required to promulgate its own preconstruction review regulation in place of deficient state regulations will the provisions of the ruling be implemented directly by EPA (through its Regional Offices).

State interest in implementing other programs involving new source reviews has increased. During 1976 one-half the states have been delegated authority to implement, through new source review, federal programs for the Section 111 New Source Performance Standards. Most of the remaining half of the states are actively negotiating for authority. A slightly lesser number of states have received or are negotiating for delegated authority to implement the National Emission Standards for Hazardous Air Pollutants under Section 112 of the Act. Only two states have been delegated authority to carry out EPA's regulations to prevent significant deterioration. Some 20 states are negotiating for or are interested in seeking this authority, but in general most prefer to wait for Congressional action before committing significant resources.

TRANSPORTATION CONTROL MEASURES

Despite the substantial emission reductions from stationary source controls and the Federal new car emission control program, many areas need further controls if the national ambient air quality standards for CO and O_x are to be attained and maintained. Recognizing this need, the Clean Air Act Amendments of 1970 (Section 110(a)(2)(B)) specifically require the use of transportation control measures where necessary. These measures include both transportation control strategies, such as inspection/maintenance (see below), transit improvements, employer incentives, traffic management/restraint, and parking management/restrictions, and stationary source control measures such as vapor controls for gasoline marketing.

Although no entire transportation control plan has been implemented to date, many metropolitan areas have made good faith efforts to adopt and implement transportation control measures. However, there have been a number of problems from the start. First, information on the effectiveness, cost, and implementability of transportation options in 1973 was limited. The extremely tight court-imposed time constraints did not allow for the investigation of social and economic effects on a case-by-case basis.

Litigation also has hampered implementation of transportation control measures. When required by court decision to develop transportation plans for many states in 1973, EPA promulgated regulations requiring state and local agencies to abate transportation-related pollution. Several states tested the legality of this approach in the Federal Courts. This issue is now pending before the Supreme Court (see Chapter X).

Prior to the recent judicial decisions concerning EPA's enforcement authority, EPA had issued notices of violation under Section 113 of the Act to several state and local governments, particularly for the failure to implement periodic emission inspection programs for in-use vehicles. Where effective legal action has been possible to enforce such measures, the Agency has pursued it vigorously. In New York City, for example, EPA has pursued legal actions and enforcement negotiations on a broad array of transportation control measures. Similarly, the Agency has recently filed suit against the State of Ohio to require the state to comply with its obligations in connection with the Cincinnati vehicle inspection and maintenance program.

Despite the problems hindering the implementation of transportation control plans, progress has been made in implementing individual transportation control measures. For example, motor vehicle emission inspection and maintenance programs are being implemented in New Jersey, Phoenix-Tucson, Portland (Oregon), Cincinnati, Chicago, and Riverside, California. Five California cities as well as Portland, Oregon, and Seattle, Washington, are developing parking management plans. Several cities, such as Philadelphia, Washington, D.C., Los Angeles, and San Francisco have inaugurated new bus lanes or priority bus/carpool lanes to provide better mass transit service, while other cities, such as Newark and Seattle, are instituting "parking freeze areas" to discourage the use of automobiles in center city areas. Still other cities, such as San Diego, are well advanced toward full implementation of gasoline recovery regulations. In areas where employer mass transit incentive regulations are in effect, numerous large industries have submitted information describing the companies' plans for reducing single occupancy auto commuter trips by their employees.

In 1973 when transportation control strategies were first promulgated, EPA was the only Federal agency requiring such plans. Recently, however, other Federal agencies have promulgated regulations requiring the implementation of transportation control measures for reasons other than air pollution abatement (see Chapter V).

As mentioned above, EPA called upon states in July 1976 to revise their state implementation plans to ensure attainment and maintenance of air quality standards. Although the Agency is relying on the states to submit revised implementation plans, during 1976 the Agency revoked gasoline rationing regulations from five affected SIPs, proposed to amend Stage II vapor recovery regulations, and, in response to a 5th Circuit

Court decision, proposed amendments to the Texas SIP. The revocation action was taken only because of the extraordinarily disruptive nature of the gasoline rationing regulations and because both Houses of Congress had expressed their desire that such regulations not be implemented.

Inspection/Maintenance

Motor vehicle inspection and maintenance (I/M) is a program of periodic vehicle exhaust inspection designed to identify those vehicles with excessive emissions. Vehicles so identified are required to be repaired before the vehicle registration can be renewed.

In the past, the importance of I/M has not been fully recognized. Recent testing by the Agency, discussed in Chapter VII, has shown that a significant number of in-use vehicles are failing to meet the required emission standards due to improper or inadequate maintenance. It therefore appears that I/M will be necessary if the full potential of the Federal motor vehicle control program is to be realized. The Agency is currently revising its technical documents to reflect the increased emission reduction potential of I/M.

The responsibility for establishing and operating I/M programs rests primarily with state and local governments. At the present time, I/M is required by State Implementation Plans (SIPs) for 27 major metropolitan areas, 6 of which already have I/M programs in various stages of implementation: Portland, Oregon; Cincinnati, Ohio; the State of New Jersey; Chicago, Illinois; Riverside, California; and Phoenix-Tucson, Arizona. The State of Rhode Island recently passed legislation for implementing I/M, while the legislatures of Massachusetts, Connecticut, Nevada, Minnesota, and Missouri are also expected to consider I/M legislation during the 1977 session.

Several notable successes have been scored by I/M programs to date. The New Jersey I/M program has stabilized and significant air quality benefits have been noted. Increased participation by private enterprise in the management and operation of I/M programs, as typified by the Arizona program design, promises to minimize demands upon state resources and manpower.

Despite these successes, much remains to be done to ensure the effectiveness and acceptability of I/M. In order to guarantee that a new car meets emission standards, the Agency is evaluating the problems posed by Section 209 of the Clean Air Act which, among other things, prohibits the states from requiring inspection of new vehicles as a condition for initial sale, titling, or registration of a new vehicle. The Agency also is making significant progress in implementing Section 207(b) of the Act, whose warranty provisions can be used to require the auto manufacturers, not the consumer, to pay for any repair work necessary to correct a vehicle which fails an I/M test.

Indirect Source Review

Indirect Source Review (ISR) is a regulation requiring SIPs to set forth legally enforceable procedures to enable the state or a local agency to determine whether the construction or modification of a facility will result in violations of the control strategy or will interfere with attainment of a standard. "Indirect sources" are facilities which do not emit air pollutants themselves, but which induce or attract significant motor vehicle traffic (e.g., highways, parking facilities and airports).

The controversial nature of this regulation and the Parking Management Program, however, led Congress to deny EPA funds to administer any program to limit or regulate parking facilities. On July 3, 1975, EPA indefinitely suspended its indirect source regulation until further clarification from Congress.

Although the Federal regulation is not being implemented at this time, certain state regulations requiring ISR have been promulgated and are being implemented. To date, 16 states, 2 territories, and 2 local areas have enacted ISR regulations; of these, 10 states and 1 locality are currently implementing indirect source review. It is worth noting that, with the exception of two projects, all facilities reviewed by the states as indirect sources have been approved as planned or approved subject to certain conditions. The conditions, if any, typically modify the pattern of entrance and exits to facilitate traffic flow. No airport reviews have been completed to date, although two projects are now underway.

The Agency has made progress in providing the technical procedures for adequate review of indirect sources. Procedures for carbon monoxide (CO) analysis have been revised; a methodology for the review of photochemical oxidants will soon be available. The latter is especially relevant to assessments of major highways and airports.

V. INTERGOVERNMENTAL RELATIONS

FEDERAL SUPPORT OF STATE AND LOCAL PROGRAMS

Status of State, Interstate and Local Pollution Control Agencies Funding

The EPA administers and coordinates the Federal environmental programs with state and local levels of government to assure the most effective partnership arrangement for the solution of common environmental problems. As part of the Federal, state and local government sharing of responsibility, the Federal government provides support through assignment of personnel, special contractual arrangements and grants. The Clean Air Act of 1970, as amended, places emphasis on the use of this support for those programs most responsible for ensuring the effectiveness of the State Implementation Plans (SIPs) for achieving the National Ambient Air Quality Standards (NAAQS).

In 1976, 55 state and territorial agencies and 235 local agencies, working in coordination with the states, expended approximately $157 million and 7100 man-years to carry out the major portions of the regulatory and enforcement aspects of the national air pollution control effort. Tables V-1 and V-2 illustrate the extent of Federal support to state and local agencies by organizational location of the agency within the state and local governmental structures and by jurisdictional areas served by these agencies.

Table V-1. ORGANIZATIONAL LOCATION OF STATE AND LOCAL CONTROL AGENCIES RECEIVING FEDERAL FUNDS

Principal Organizational Type	1975				1976			
	Total	No. receiving Federal funds		No. operating without Federal funds	Total	No. receiving Federal funds		No. operating without Federal funds
		State	Local			State	Local	
Environmental	43	22	13	8	46	22	16	8
Health	132	17	87	28	120	15	74	31
Air Pollution	94	6	52	36	99	7	54	38
Natural Resources	7	7	-	-	8	8	-	-
Other	15	2	10	3	17	1	8	8
Total	291	54	162	75	290	53	152	85

Table V-2. DISTRIBUTION OF FUNDS BY JURISDICTIONAL AREAS OF STATE AND LOCAL CONTROL AGENCIES[a]

(Estimated 1975 and 1976 Expenditures)
(Dollars in Thousands)

Jurisdictional Category	Number of Agencies	1975 Expenditures			Number[b] Agencies	1976 Expenditures		
		Federal $	State/ Local $	Total		Federal $	State/ Local $	Total[c]
				Local				
Cities	44	$ 5,900	$13,500	$19,400	44	$ 5,800	$15,600	$ 21,400
Counties[1]	91	10,400	20,900	31,300	79	8,400	12,200	20,600
Multi-county	27	3,100	9,000	12,100	29	6,700	18,300	25,000
Subtotal Local	162	19,400	43,400	62,800	152	20,900	46,100	67,000
				State[2]				
Subtotal State	54	33,200	47,800	81,000	53	34,400	48,600	83,000
Total	216	$52,600	$91,200	$143,800	205	$55,300	$94,700	$150,000

[a] Total number of agencies receiving Federal monies for air pollution control work either directly or by designation in grant to state agency. Direct grants approximate 182 for 1975, 169 for 1976. Monies include assignees, contractual support and grants.

[b] Twelve cities now receive funds through the Federal grant made to state, 17 county agencies receive money through Federal grant made to state, 7 regional agencies receive money through Federal grant made to state. Formation of a multicounty agency from four county agencies in California accounts for $9,200,000 increase in state/local funds for multi-county agencies and the decrease for county agencies.

[c] In 1976 the 85 agencies that did not receive Federal funds directly or on an indirect stipulation in Federal grants to states contributed approximately $7,000,000 to air pollution control activities, making the total estimated expenditures approximately $157,000,000 for 1976.

[1] Includes agencies that are combination city-county agencies, county agencies that service large metropolitan areas, and city agencies serving more than one county. Many county agencies cover a large met ropolitan area; for example, Wayne County, Michigan (Detroit); Allegheny County, Pennsylvania (Pittsburgh).

[2] States include District of Columbia, Puerto Rico, Virgin Islands and Guam. American Samoa did not receive grant funds in 1975; American Samoa and Ohio did not receive grant funds in 1976.

The figures show a relatively unchanged level of total expenditures and an insignificant change in the relative funding and expenditure of monies by the various levels of government. At the same time, EPA has expanded and revised its programs: (1) to assure that SIPs provide for the attainment and maintenance of the NAAQS as expeditiously as practicable and (2) to provide for the prevention of significant deterioration of the air.

In attempting to satisfy the above air quality goals, EPA's programs to aid the implementation and promote the delegation of authority to the state and local governments for new source review have received increased attention. Similarly, the federally administered review programs for national emission standards for hazardous air pollutants (NESHAPS), new source performance standards (NSPS), prevention of significant deterioration (PSD) and indirect source review (ISR) have received increased attention. Increasingly, states and substate units have requested delegation of authority to administer their review programs. (Chapter IV of this report includes a more detailed description of ongoing air quality management efforts.)

Increasingly, in order to develop workable control strategies to meet promulgated air quality goals, Federal and state control efforts have sought essential coordination and input from regional and local air pollution control agencies, state and local planning agencies, transportation agencies and councils of governments.

Federal Financial Assistance to Air Pollution Control Agencies

In 1976 EPA provided financial assistance to 53 state agencies (all except Ohio and American Samoa) and 116 local agencies. In addition, 36 local agencies received Federal monies through specified provisions of state grants or special contractual assistance. The total expenditures of these 205 agencies represented approximately 96 percent of all expenditures for the 290 agencies having some air pollution control responsibilities. The support provided to the agencies was in the form of grants for planning, developing, establishing, improving or maintaining control programs. This support also included special contractual assistance and demonstration grants to assist the agencies in meeting requirements imposed for the preparation, submittal, and revision of their SIPs and for technical aspects of the enforcement and revisions associated with the regulatory and monitoring provisions of the local control strategies.

Resources of State and Local Air Pollution Control Agencies

Total expenditures (Federal, state, local) for the support of air pollution have grown from $13 million in Fiscal Year 1965 (FY 65) to an estimated $157 million (including agencies not receiving any Federal support) in FY 76. The growth rate in FY 76 was approximately five percent over the FY 75 level.

The increase in the number of employees of state and local control agencies is an indicator of the nation's growing commitment to controlling air pollution. Table V-3 shows that control agency staff has almost

Table V-3. ESTIMATED MAN-YEARS OF EFFORT EMPLOYED BY STATE AND LOCAL AIR POLLUTION CONTROL AGENCIES[a]

Fiscal year	State		Local		Total state/local	
	Positions	Man-years	Positions	Man-years	Positions	Man-years
1969	1000	920[b]	1840	1660[b]	2840[b]	2580
1971	1540	1420[b]	2630	2370[b]	4170[b]	3790
1973	2930	2770	3270	2870	6200	5640
1974	3970	3490	3270	3000	7240	6490
1975	4030	3500	4010	3300	8030	6800
1976[c]	4210	3770	4170	3340	8380	7110

[a] All figures involve estimating full- and part-time positions either from manpower surveys or budgets provided in grant awards.

[b] Estimated from position information using verified man-year/position ratios from 1973 and 1974.

[c] 1976 estimates based on preliminary information.

tripled in the last six years. The 1976 on-board positions represent approximately 7110 equivalent full-time man-years of effort.

Resources increased by approximately 300 man-years and $9 million between June 1975 and July 1976. These increases were approximately 50 percent less than those experienced in the 2 previous years. The state and local fund increase of approximately 6 percent ($6 million) over the FY 75 level did not keep pace with expected increases and was a 14 percent decrease from the rate of growth for previous years. Federal support to these agencies increased by approximately five percent ($3.0 million).

The focus of Federal support to state and local control agencies has been on the implementation of SIPs and their coordination with other national goals, such as energy conservation. In FY 76 control agencies gave the highest priority to the enforcement actions necessary for attaining total suspended particulate and sulfur dioxide NAAQS, improvements of monitoring networks required for continual assessment of pollutant concentrations, and long-term attainment and maintenance of the NAAQS.

The estimated percentage of resources committed to various aspects of these national efforts to attain and maintain the standards is shown in Table V-4.

Table V-4. ESTIMATED DISTRIBUTION OF RESOURCES DEVOTED TO AIR POLLUTION CONTROL ACTIVITIES OF NATIONAL PRIORITY BY STATE AND LOCAL CONTROL AGENCIES[a] IN FY75-76

Activity	Estimated percentage of resources FY75	FY76 (Prelim.)
Compliance with State Implementation Plan Regulations	44	40
Development and Implementation of Revisions to and Completion of SIPs	6	8
Transportation Control Plans and Mobile Source Inspection and Investigation	7	7
Ambient Air Quality Monitoring Network Operation and Completion	18	22
Supportive Activities (Management data and policy review, environmental impact statements, training, etc.)	25	23

[a] Estimates are based on a total estimated expenditure of $143 million for FY75 and $150 million for FY76.

Federal Assistance In Training Air Pollution Manpower

To assist and improve state and local governmental air pollution control agencies'(as well as the private sector) technical and administrative performances related to air quality management, EPA conducts short-term technical training courses and workshops at numerous selected regional locations. During calendar year 1976, 25 different courses were presented with a total of 59 course presentations. Of these, 20 were held at EPA's Research Triangle Park, North Carolina, facility and 30 were held at various locations across the U.S. Four workshops were also presented on special topics of emerging interest. A total of 1,297 students participated in 5,725 student days of training in the short-course presentations and workshops. In addition to these formal courses, 166 students were awarded certificates for completion of Self-Instructional Courses made available by EPA. The students attending the short-term technical courses represented a variety of government agencies and private entities, as indicated by Table V-5.

EPA provides funds for university training for employees of state and local governmental air pollution control agencies and others through programs of graduate level fellowship awards and grants to universities. During 1976, EPA provided fellowships for 106 control agency employees for part-time studies, for 35 control agency employees for full-time studies, and for 18 other individuals for full-time studies. Recipients of the training benefits came from 25 state and 24 local agencies. Graduate level training grants to 9 universities provided support for 68 students and provided modest support to the universities in their programs of teaching in the air pollution field. Grants were made to three universities for

Table V-5. ATTENDANCE AT SHORT-TERM TECHNICAL COURSES

Employer	Number of students
EPA	442
Other Federal agencies	63
State governments	381
Local governments	195
Consulting firms	26
Industry	142
All other	48
Total	1,297

support of special programs involving training of automobile mechanics as related to emission control, training of environmental program managers, and summer internships for students interested in air pollution control.

Federal Assistance in the Utilization of Technical Literature

EPA provides assistance to state and local governmental air pollution control agencies (as well as commercial enterprises, universities and others) in their use of information contained in published literature. Thousands of items related to air pollution and its control are published each year. EPA supports the operation of literature storage, indexing and retrieval systems; distributes lists of publications; furnishes copies of its own publications, and publishes special topic bibliographic compilations to facilitate the utilization of published literature. In 1976, many computerized searches were provided to interested parties and thousands of copies of publications were distributed to members of the public in an effort to ensure that programs and decisions were benefited by the availability of relevant published information.

INTERAGENCY COOPERATION

The continued evolution in scope and sophistication of State (air quality) Implementation Plans in order to address the NAAQS attainment and maintenance goals has highlighted the need for increased interagency cooperation. Closer coordination of EPA's land use, transportation, and energy-related programs with the regulations and programs of other Federal agencies should serve to reduce certain administrative burdens while ensuring the most expeditious implementation of needed control strategies. The Agency has and is currently focusing attention toward the following areas.

Department of Transportation's (DOT) Transportation Improvement Program Regulation

On September 17, 1975, DOT issued the Transportation Improvement Program regulations which govern the planning and programming of all urban transportation improvements administered by both the Federal Highway Administration (FHWA) and the Urban Mass Transportation Administration (UMTA).

From EPA's viewpoint the most significant aspect of the DOT regulation is the requirement for the annual preparation of a Transportation System Management (TSM) element. The TSM plan is designed to meet short-term transportation needs and thus emphasizes making efficient use of existing facilities. The emphasis on short-range measures is consistent with EPA's need to achieve the air quality standards as expeditiously as practicable. TSM measures identified by DOT include: traffic flow improvements, preferential transit treatment, bike and pedestrian facilities, parking management, work schedule changes, pricing policies, carpooling programs, auto-free zones, park-ride bus service, express bus service, etc. In summary, TSM employs a variety of locally conceived operating, regulatory and pricing policies to bring about a more rational organization of the public transportation system and a better balanced use of the private auto. Many of these kinds of measures are currently required by SIP transportation control plans making obvious the importance of TSM measures to EPA.

Despite these similar federal requirements EPA is the only federal agency to require both the planning and implementation of comprehensive strategies of transit improvement and auto restraints. Basic differences do exist between DOT and EPA:

1. While DOT only requires approval of the process leading to the plan, EPA actually approves the plan;

2. DOT does not prescribe specific objectives, but rather requires that transportation plans meet broad criteria of efficiency and cost-effectiveness, while EPA requires the plan to achieve a single objective (attainment of the NAAQS);

3. DOT does not impose rigid deadlines for implementing certain measures, while EPA requires the plan to achieve the objective by a deadline.

Consideration should be given to linking more tightly the similar transportation programs of DOT, EPA, and FEA. If the air quality standards are to be achieved in expeditious fashion, DOT and EPA should first require adequate evaluation of alternative strategies and, second, incremental progress in the implementation of those strategies determined to be reasonable. For example, greater flexibility could exist to reward, by increasing the Federal funding share, a locality willing to initiate programs (e.g., a transportation control plan) to achieve national objectives (e.g., the air quality standards).

EPA is currently working on development of procedural guidelines to coordinate the Agency's transportation requirements with those of DOT. Such guidelines should result in selection of program elements that better meet the objectives of both agencies. For example, DOT could receive wider agency and citizen support for TSM plans if such plans are based on a process that explicitly considers air quality objectives. EPA's regulatory authority and sanctions could better ensure that TSM measures are programmed and implemented. EPA would receive transportation improvement plans that have been locally generated and adopted by the responsible decision-makers; in many cases these measures could replace EPA promulgations. Parallel Federal requirements could also be streamlined and made more efficient, resulting in one integrated process and product. Ideally, EPA and DOT process requirements should be integrated.

FHWA 109(j) Consistency Determination Requirement

The 1970 Federal-Air Highway Act added Section 109(j) to Title 23 of the United States Code, directing DOT to develop and promulgate guidelines to ensure that highways constructed with Federal funds are consistent with SIPs for achieving the air quality standards. The FHWA Regional Administrator, after consultation with the EPA Regional Administrator, is responsible for making the annual consistency determination.

The 109(j) consistency requirement serves to formally coordinate on an annual basis FHWA's highway and EPA's transportation control planning processes. Consistency determinations between proposed highway and transportation control plans are made for future years depending on the severity of the existing and future air pollution problems. Hence, a mechanism is established that explicitly links highway and air quality objectives.

Energy Policy and Conservation Act, Public Law 94-163 (EPCA)

In response to Section 362, State Energy Conservation Plans of EPCA, Federal Energy Administration recently promulgated regulations which provide guidelines for the states to use in preparing these plans. Since this element of the conservation plans is so closely related to EPA's transportation control measures, the Agency has supplied FEA with detailed comments and suggestions during all stages of the promulgation of these regulations. The Agency will be further coordinating with FEA through the EPA Regional Offices. These offices will be providing information and guidance to the States regarding the planning and implementation of those aspects of the Conservation Plan which overlap the SIP transportation control measures. Those states choosing to develop an energy plan are required to include programs to promote carpools, vanpools, and public transportation. Furthermore, these plans may include transportation controls which are defined as "incentives, disincentives, restrictions and requirements designed to reduce the amount of energy consumed in transportation."

Incentives to Develop Underground Coal Mines

EPCA, in Section 102, establishes a Federal loan guarantee program to stimulate the production of low-sulfur coal from underground mines. FEA is designated to administer the program. Applicants for loan guarantees must, as one requirement, have established a contract with a coal consumer who can, as certified to by EPA, burn the coal in compliance with all applicable requirements of the Clean Air Act and any implementation plans. EPA is coordinating closely with FEA to establish appropriate procedures for handling this requirement.

Energy Supply and Environmental Coordination Act, Public Law 93-319

This law requires, among other things, that FEA prohibit certain major fuel-burning plants from using oil or natural gas as a primary fuel. The law also requires that EPA ensure that public health is protected and inform FEA of the earliest date by which the plants receiving the prohibitions from FEA can comply with applicable air pollution control requirements while burning coal. EPA has worked closely with FEA from the time this program began. To date, FEA has issued prohibition orders to 74 generating units at 32 plants and is planning to act, early in 1977, on some subset of another 229 plants now under consideration.

Coordination on Other Energy Matters

Excellent continuing data exchange is carried out with the Federal Power Commission on matters affecting utilities. Through such exchange of information, computer programs have been developed which identify for each plant the applicable air pollution control regulations, the use and environmental quality of fuel, and the plans for the future. These programs have permitted the analysis of a number of energy/environmental problems, e.g., the environmental impact of natural gas curtailments over the next five years.

Staff-level coordination with the Bureau of Mines has been established to work toward a better understanding of the relationships between environmental requirements and coal reserves. For example, since many of the SO_2 regulations limit emissions in $\#SO_2/10^6$ Btu, the Bureau has been asked to express reserve data in similar units.

Department of Housing and Urban Development

An interagency agreement has been signed with the Department of Housing and Urban Development. The agreement deals with coordination between air quality planning and the Comprehensive Planning Assistance Program (701) and parallels a similar agreement signed between HUD and EPA's water quality planning office. A major purpose of the agreement is to ensure that any land use policies and control strategies undertaken for air quality improvement are developed and implemented within a broader framework of comprehensive planning and management and to ensure that comprehensive planning and management reflects the constraints of the Clean Air Act in attaining and maintaining standards and in preventing significant deterioration of air quality.

Coastal Zone Management

The Agency is in the process of developing integrated guidelines for coordination with and review of coastal zone management (CZM) programs. These are important because of the potential impact of coastal development decisions on air quality and because of the requirements under the CZM Act for Federal consistency with completed CZM plans. These guidelines should be completed early in 1977.

Intra-agency Coordination

As part of a policy to encourage a more comprehensive approach to air quality planning, EPA has been developing guidelines for coordination with other long-range planning efforts. Within the agency itself, guidelines for coordinating air quality planning with water quality planning were developed during 1975 and were updated in 1976. The guidance also addressed the funding of eligible air quality items in assessing the air quality impacts of 208 plans.

INTERNATIONAL COLLABORATION IN CONTROL OF AIR POLLUTION

EPA Contributions to International Organizations

Air pollution control has remained an important focus of the environmental programs of international organizations. Following is a summary of programs with which EPA is involved.

The Final Act of the Conference on Security and Cooperation in Europe, signed by President Ford in 1975, called for cooperation in the field of monitoring and evaluation of the long-range transport of air pollutants. Initial technical consultations, under the auspices of the UN Economic Commission for Europe (ECE), have established the groundwork for a sulfur dioxide (SO_2) emission survey for East and West Europe and drafted a plan for the first phase of a regional monitoring program. At the same time, the Air Management Group of the Organization for Economic Cooperation and Development (OECD) Environment Committee has been analyzing available control strategies to reduce emissions and consequently acid rain.

In 1976 OECD concluded an international examination of photochemical oxidants and their precursors in the atmosphere. The study concluded that the relationship between nitrogen oxides (NO_x) and hydrocarbons (HC) and oxidant (O_x) formation is more complicated than previously anticipated and warrants further OECD inquiry. An International Conference on Photochemical Oxidant Pollution and its Control, co-sponsored by OECD and EPA in September 1976,provided a forum for scientists and government administrators to discuss the controversial issues of achievability of standards, the role of precursors and the significance of transport.

With the assistance of U.S Government health effects experts, the World Health Organization (WHO) has developed criteria which will be utilized internationally for sulfur oxides, particulates, nitrogen oxides and photochemical oxidants. Serving as the WHO Collaborating Center for Air Pollution Control and now as the WHO Collaborating Center for Environmental Pollution Control, EPA has prepared for international distribution manuals of methods for measuring selected air pollutants and guidelines for monitoring of air quality in urban and industrial areas. EPA has provided data processing and analysis for the WHO Air Pollution Network and, in conjunction with NOAA, the Atmospheric Turbidity and Precipitation Chemistry Networks of the World Meteorological Organization (WMO). EPA experts have also continued to train foreign technicians in measurement, monitoring and analysis techniques on behalf of WHO and WMO.

For one United Nations Environment Program (UNEP), scientists from EPA have provided technical guidance in the design and implementation of the Global Environmental Monitoring System.

At the October NATO/CCMS*Plenary meeting, the U.S. presented the second follow-up report to the CCMS Air Pollution Study. The report indicated that NATO countries are making progress in ambient monitoring and that air quality trends show a decrease in air pollution levels. The

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* NATO Committee on the Challenges of Modern Society

current CCMS Air Pollution Assessment Methodology and Modeling Study has inventoried air quality dispersion models in use in NATO countries and is developing standardized models and data specifications.

Via international organizations such as ECE's Group of Rapporteurs on Air Pollution and the International Standards Organization (ISO), EPA has been working to ensure comparability and potential standardization between emissions sampling and measurement methods used in the U. S. and those of other countries.

The International Civil Aeronautics Organization (ICAO) has developed the framework for an international emission standard for large subsonic gas turbine aircraft.

Transboundary Air Pollution Surveillance and Control - Canada and Mexico

EPA cooperates with its contiguous neighbors to the north and south in monitoring air pollution, conducting research into control strategy mechanisms, and in negotiating specific control devices and procedures for individual industrial sources of pollution. This activity is much greater along the Canadian border, where industrial sources of pollution are much more numerous, than in the U.S.-Mexico frontier area.

Under the International Joint Commission, whose function it is to help resolve potentially contentious issues between the United States and Canada, an Air Advisory Board has been established to monitor air pollution along the border between the two countries and to make recommendations for pollution abatement. In addition, a special Ontario-Michigan Air Board has been set up to cope with the especially troublesome problems in the Detroit-Windsor area.

Recognizing the need for better air pollution surveillance along the U.S.-Mexican border, representatives of the two countries met several times during 1976 in order to plan air monitoring activities. Several monitoring points are being established.

Bilateral Research and Development Activities

Air pollution projects under the U.S.-USSR Environmental Agreement include Air Pollution Modeling, Instrumentation and Measurement, Methodology, Process Improvements and Modification, Ferrous Metallurgy Technology, Gaseous Emission Abatement, Particulate Abatement, and Mobile Source Control. Research work is being carried on to develop industrial processes which will produce less air pollution: desulfurization and demetallization of fuel oils, dry quenching of coke, and flotation desulfurization of coal. A project on the Effects of Atmospheric Pollution on Climate is headed by the National Oceanic and Atmospheric Administration.

Under the U.S.-Japan environmental program there are two active projects, Photochemical Air Pollution and Air Pollution Related Meteorology.

One project in air pollution monitoring is being carried on under the U.S.-Spain Science and Technology Agreement, and discussions are being held under the U.S.-Federal Republic of Germany Agreement on the development of joint projects on flue gas desulfurization and air quality planning and maintenance.

Cooperative research with other countries is also conducted under the EPA Scientific Activities Overseas program (SAO), funded from excess foreign currencies accruing to the U.S. through sales of U.S. farm products under the Agricultural Trade Development and Assistance Act of 1954, as amended (PL 480). Cooperative air pollution research projects currently are being carried out in two excess currency countries, namely Poland and Yugoslavia. The projects encompass practically all environmental aspects of air pollution, including identification of specific pollutants and their impact on human health, development of control technologies, and implementation of systems and procedures to monitor ambient conditions. For example,EPA and Polish scientists are studying glaciers in several parts of the world to determine whether they can serve as a historical "pollution index." These scientists are analyzing the contents of ice, especially for heavy metal and radioactive pollutants, to learn about the long-range transport of pollutants and to predict future trends in the biosphere.

Other studies in Poland are concerned with the effects of industrial emissions on tree growth and the development of control equipment for copper smelters to improve the efficiency of sulfur dioxide removal systems.

In Yugoslavia studies are utilizing existing technologies and developing new technology for high tempearature gas cleaning in the smelter industry. These studies are directed toward reductions of capital investment and power supply costs and increased emission control efficiency.

VI. CONTROL OF STATIONARY SOURCES

NEW SOURCE PERFORMANCE STANDARDS

The Clean Air Act requires EPA to establish national standards of performance for certain new and modified stationary pollution sources. These standards, the Act says, must reflect a "degree of limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction) the Administrator determines has been adequately demonstrated." According to the Act, these standards are to be set for those types of pollution sources which EPA determines "may contribute significantly to air pollution which causes or contributes to the endangerment of public health or welfare."

During 1976, standards of performance were promulgated for the following categories of stationary sources under Section 111 of the Clean Air Act:

1. Primary Copper Smelters -- Standards were promulgated on January 15, 1976, and limit emissions of particulate matter from dryers to 50 mg/dscm (0.022 gr/dscf). In addition, the opacity of these emissions is limited to 20 percent. Emissions of sulfur dioxide from roasters, smelting furnaces, and copper converters are limited to 0.065 percent by volume (650 ppm) averaged over a six-hour period. Where a sulfuric acid plant is used to comply with this standard, the opacity of the gases discharged into the atmosphere is limited to 20 percent. Presently, there are fifteen copper smelters in the United States. Copper consumption is expected to grow through 1980 at 3.2 percent compounded annually, requiring an increase in

smelter production from the 1,500,000 ton rate in 1971 to approximately 2,000,000 tons in 1980. After promulgation of the standards, ASARCO, Newmont Mining Corporation, Magma Copper Company, Kennecott Copper Corporation, and the Natural Resources Defense Council filed suit in the U.S. Court of Appeals for the District of Columbia Circuit. The suit is still pending.

2. Primary Zinc Smelters -- Standards were promulgated on January 15, 1976, and limit emissions of particulate matter from sintering machines to 50 mg/dscm (0.022 gr/dscf). The opacity of these emissions is limited to 20 percent. Emissions of SO_2 from roasters and from any sintering machine which eliminates more than 10 percent of the sulfur initially contained in the zinc sulfide concentrates processed are limited to 0.065 percent by volume (650 ppm) averaged over a two hour period. Where a sulfuric acid plant is used to comply with this standard, the opacity of the gases discharged into the atmosphere is limited to 20 percent. In mid-1973, there were eight existing primary zinc smelters in the United States. The copper smelter litigation applies to the zinc smelter standards also.

3. Primary Lead Smelters -- Standards were promulgated on January 15, 1976, and limit emissions of particulate matter from blast furnaces, dross reverberatory furnaces, and sintering machine discharge ends to 50 mg/dscm (0.022 gr/dscf). The opacity of these emissions is limited to 20 percent. Emissions of SO_2 from sintering machines, electric smelting furnaces, and converters are limited to 0.065 percent by volume (650 ppm) averaged over a two-hour period. Where a sulfuric acid plant is used to comply with this standard, the opacity of the gases discharged into the atmosphere is limited to 20 percent. There are six primary lead smelters in the United States with little growth expected. The copper smelter litigation applies to the lead smelter standards also.

4. Coal Preparation Plants -- Standards were promulgated on January 15, 1976, and limit particulate matter emissions from coal preparation and handling facilities processing more than 200 tons/day of bituminous coal as follows: (1) emissions from thermal dryers may not exceed 0.070 g/dscm (0.031 gr/dscf) and 20% opacity, (2) emissions from pneumatic coal cleaning equipment may not exceed 0.040 g/dscm (0.018 gr/dscf) and 10% opacity, and (3) emissions from coal handling and storage equipment may not exceed 20% opacity. Long-term forecasts indicate a rise in cleaned coal requirements from 323 million tons in 1970 to 580 million tons in 1985.

5. Primary Aluminum Reduction Plants -- Standards were promulgated on January 26, 1976, and limit fluoride emissions from each potroom group within Soderberg plants to 2.0 pounds of total fluorides per ton of aluminum produced (lb TF/TAP), from each potroom group within prebake plants to 1.9 lb TF/TAP, and from each anode bake plant within prebake plants to 0.1 lb TF/TAP. Primary and secondary emissions from potroom groups are limited to less than 10 percent opacity and emissions from anode bake plants are limited to less than 20 percent opacity. Domestic aluminum production capacity was about 4.8 million tons in 1972 and is expected to increase to 7.2 million tons in 1980. After promulgation, Alcoa, Kaiser Aluminum and Chemical Co., National Steel, and Revere Copper and Brass filed petitions for review of the standards in the U.S. Court of Appeals for the District of Columbia Circuit.

6. Ferroalloy Production Facilities -- The standards were promulgated on May 4, 1976, and limit particulate matter emissions from dust handling equipment and particulate matter and carbon monoxide emissions from the electric submerged arc furnace. Emissions of particulate matter from the control device are limited to less than 0.45 kg/MW-hr (0.99 lb/MW-hr) for furnaces producing high-silicon alloys (in general) and to less than

0.23 kg/MW-hr (0.51 lb/MW-hr) for furnaces producing chrome and manganese alloys. For both product groups, emissions from the control device must be less than 15 percent opacity. The regulation requires that the collection hoods capture all emissions generated within the furnace and capture all tapping emissions for at least 60 percent of the tapping time. The concentration of carbon monoxide in any gas stream discharged to the atmosphere must be less than 20 volume percent. Emissions from dust handling equipment may not equal or exceed 10 percent opacity. There are about 50 existing ferroalloy production facilities in the United States.

In 1976, standards of performance were proposed for the following source categories: Kraft Pulp Mills, Petroleum Refinery Sulfur Recovery Plants, and Lignite-fired Steam Generators. In addition, EPA also proposed revisions to the opacity standard for petroleum refinery fluid catalytic cracking unit catalyst regenerators and EPA Reference Methods 1-8, and promulgated amendments to Reference Methods 13A and 13B. A final decision was handed down by the U.S. District Court of Appeals for the District of Columbia Circuit on July 21, 1976, in National Asphalt Pavement Association, et al. vs Train; the decision upheld the use of opacity standards of performance as a measure of emissions from stationary sources.

CONTROL OF HYDROCARBON EMISSIONS

During the past year, emphasis has been shifted to facilitate high priority oxidant-related regulatory activities. These effort to control emissions of non-methane hydrocarbons fall into three broad areas: (1) petroleum production, refining, storage and transfer operations; (2) organic chemical manufacturing; and (3) end use applications (e.g., surface coatings and degreasing operations). These groupings should cover approximately two-thirds of stationary source emissions of non-methane hydrocarbons.

The remaining one-third of stationary source emissions of non-methane hydrocarbons comes from combustion sources (principally open burning), agricultural uses (principally pesticides application), and other industrial processes (e.g., primary metals, wood processing and food preparation). These sources will be incorporated into the program as resources permit.

Within each of these three areas, all ongoing and future activities will be directed toward the preparation of guidance materials, including information on available control technology, to assist states in the preparation of SIP revisions for oxidant control and the development of NSPS. The SIP guidance materials will set forth new regulatory approaches where necessary and present data on emission limitations and regulatory timeframes which reflect reasonably available control technology (RACT) for a source category when viewed as a whole. The states, however, are to develop the specific regulatory requirements including emission limits. These should reflect RACT for particular sources within their jurisdictions.

Where feasible and practical, NSPS will be developed for common types of emission sources. For example, a common standard may be developed to control emissions resulting from the transfer of volatile organic liquids from one container to another, regardless of the facilities between which such a transfer may take place. It should also be noted that many of the sources identified in these three areas will have to be regulated by means of equipment and process specification and operating and maintenance guidelines rather than by emission standards.

These programs will be unusually complex, involving a large number of materials, processes, and companies. The organic chemical manufacturing study, for example, must evaluate regulation of the production of over 600 volatile organic compounds which are produced in large quantities and exhibit known or potential toxicity characteristics. Many of these compounds are, of course, manufactured by more than one process, each of which must also be evaluated.

111(d) STANDARDS

The Clean Air Act Amendments of 1970 address three general categories of pollutants emitted from stationary sources. The first category consists of pollutants (often referred to as "criteria pollutants") for which air quality criteria and national ambient air quality standards are established under Sections 108 and 109 of the Act. Under the 1970 amendments, criteria pollutants are controlled under Section 110 and, in some cases, by standards of performance for new sources established under Section 111. The second category consists of pollutants listed as hazardous pollutants under Section 112 and controlled under that section.

The third category consists of pollutants that are (or may be) harmful to public health or welfare but are not or cannot be controlled under Sections 108-110 or 112. Section 111(d) of the Act requires control of existing sources of such pollutants (referred to here as "designated pollutants") whenever standards of performance (for these pollutants) are established under Section 111(b) for new sources of the same type. Existing facilities subject to such control are referred to here as "designated facilities." On November 17, 1975, EPA promulgated regulations establishing procedures and requirements for submittal of State plans for the control of designated pollutants from such facilities. The regulations provide that after a standard of performance applicable to emissions of a designated pollutant from new sources is promulgated, the Administrator will publish guideline documents containing information pertinent to control of the same pollutant from designated (i.e., existing) facilities. The guideline documents will include "emission guidelines" and compliance dates.

The Administrator's determination whether a designated pollutant is health-related, welfare-related, or both and the rationale for the determination will be provided in the guideline document for that pollutant. For both health-related and welfare-related pollutants, emission guidelines will reflect the degree of control attainable with the application of the best systems of emission reduction which (considering the cost of such reduction) have been adequately demonstrated for designated facilities. For health-related pollutants the emission guidelines and compliance times will appear in the Federal Register, whereas for welfare-related pollutants they will appear in a guideline document only. The degree of control reflected in EPA's emission guidelines will take into account the costs of retrofitting existing facilities and thus will probably be less stringent than corresponding standards of performance for new sources.

After publication of a final guideline document for a designated pollutant, the states will have nine months to develop and submit plans containing emission standards for control of that pollutant from designated facilities. In general, state emission standards must ordinarily be at least as stringent as the corresponding EPA guidelines to be approvable. States will have more flexibility in establishing plans for welfare-related pollutants than for health-related pollutants. Within four months after the date required for submission of a plan, the Administrator will approve or disapprove the plan or portions thereof. If a state plan (or portion thereof) is disapproved, the Administrator will promulgate a plan (or portion thereof) within six months after the date required for plan submission.

To date, the only designated pollutant/designated facility combinations are: (1) sulfuric acid mist emitted from sulfuric acid production units (notice of availability of draft guideline document published November 4, 1976); (2) fluorides emitted from five categories of sources in the phosphate fertilizer industry (notice of availability of final guideline document published March 1, 1977); and (3) fluorides emitted from primary aluminum plants (delayed due to litigation).

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS)

On October 21, 1976, a NESHAPS standard was promulgated which applies to approximately 50 ethylene dichloride-vinyl chloride and polyvinyl chloride plants. Vinyl chloride has been found to cause angiosarcoma and other serious disorders, both cancerous and noncancerous, in people with occupational exposure and in animals with experimental exposure to vinyl chloride. Reasonable extrapolations from these findings caused concern that vinyl chloride may be causing the same or similar disorders at current ambient air levels. The purpose of the standard is to minimize vinyl chloride emissions from all known process and fugitive emission sources to the level attainable with best available control technology. This will minimize the health risks to people living in the vicinity of these plants and to any additional people who are exposed as a result of new construction. The standard is expected to reduce emissions from a typical ethylene dichloride-vinyl chloride plant by approximately 94 percent and from a typical polyvinyl chloride plant by approximately 95 percent.

It will cost approximately $198 million to install equipment at existing plants to meet the standard and another $70 million/yr to operate and maintain the equipment. The price of polyvinyl chloride resins is expected to increase by 7.3 percent as a result of the standard.

On November 19, 1976, the Environmental Defense Fund (EDF) petitioned the court for review of the vinyl chloride standard. Litigation is still in process.

REGISTRATION OF FUELS AND FUEL ADDITIVES

On November 7, 1975, EPA promulgated the "Registration of Fuels and Fuel Additives" Regulations (40 CFR Part 79). As of November 12, 1976, 1,837 fuel additives, 510 motor vehicle gasolines, and 244 motor vehicle diesel fuels have been registered; 319 additive manufacturers and 132 fuel manufacturers have reported these additives and fuels. The deadline date of November 8, 1976, for the registration of motor vehicle diesel fuels was met on time. The first periodic report forms due are the quarterly reports for gasoline, which are due by February 15, 1977.

The regulations require that, should EPA decide that testing of fuels and fuel additives by the manufacturers is necessary, this testing must be carried out using test protocols provided by EPA. EPA currently has under development three such protocols: Health Effects, Welfare Effects, and Emissions Control Device Performance. These are expected to be available by late 1977.

DEVELOPMENT OF NEW AND IMPROVED AIR POLLUTION CONTROL TECHNIQUES FOR STATIONARY SOURCES

The development and demonstration of control technology for stationary source air pollution is one of EPA's most important tasks. EPA's goal in developing stationary source air pollution controls is fourfold:

To describe at least one environmentally sound method of control for each major source of pollution, including development and demonstration, if necessary;

To provide a technical base for the Agency's enforcement activities

To establish technical and economic data to support New Source Performance Standards (NSPS); and

To provide information upon which to base an environmentally sound energy development policy.

SULFUR OXIDES

The Agency has directed much of its research and development effort in the sulfur oxide (SO_x) control area toward demonstration of flue gas desulfurization (FGD). This technology removes SO_2 from the gas stream after a fuel is burned. The emphasis on FGD has been dictated by its economic feasibility and by its availability for near-term application. EPA has funded, either totally or partially, a number of major projects over the past several years. Included in these are the following large-scale electric utility oriented projects:

Pilot work at Research Triangle Park, N.C. and a prototype system at the TVA Shawnee Steam Plant for development, demonstration and optimization of lime and limestone scrubbing technology.

Magnesium oxide scrubbing demonstrations at Boston Edison Company and Potomac Electric Power Company.

Sodium sulfite/bisulfite scrubbing (Wellman-Lord Process) at the Northern Indiana Public Service Company.

Aqueous carbonate process demonstration at Niagara Mohawk.

Double alkali process demonstration at Louisville Gas and Electric.

Control techniques suited to smaller industrial and commercial combustion sources are being examined in full-scale test programs at a General Motors double alkali installation, at a U.S. Air Force installation using the Bahco lime scrubbing process, and at a St. Joe Minerals Company installation using the citrate process. Supporting and supplementing these major demonstrations are numerous other projects, such as full-scale testing on commercially installed systems, engineering studies, and smaller-scale hardware studies.

The commercial economics of FGD technology, including by-product marketing and disposal options and the evaluation of new processes or process improvements are the subjects of continuing engineering efforts. A major effort underway in technology transfer will promote use of the best and most reliable techniques and equipment of future FGD installations.

The Agency is also studying a number of other approaches for reducing sulfur oxide emissions. One such approach is to "clean" a fuel (to remove the sulfur and other contaminants) before the fuel is burned. This pretreatment method is especially suited to sources smaller than electric utilities, e.g., industrial boilers and fuel-burning equipment. EPA is studying several techniques for removing pollutants from fuels. One technique involves physically and/or chemically cleaning coal with moderate sulfur content so that it can be burned in conformance with clean air standards. EPA's objectives in this area are (1) to develop commercially-available processes for removing inorganic sulfur and ash from medium-sulfur coal, while producing reuseable wastes, or wastes which will not degrade the environment when discarded; (2) to define the environmental problems associated with existing fuel cleaning technologies; and (3) to derive means of minimizing those problems which could hinder application of fuel cleaning technologies.

In the clean fuels area, EPA is also studying the use of clean liquid and gaseous synthetic fuels derived from coal. A program on residual oil processing and utilization aims at defining better means of removing sulfur and other pollutants in producing a clean synthetic fuel. The major objectives of synthetic fuels are to determine the potential environmental impacts of processing these fuels and to develop means of minimizing the adverse environmental effects of synthetic fuel technologies.

Another approach to reducing SO_x emissions is to absorb the gas during the combustion process. The Agency's efforts in combustion modification have involved primarily the Fluidized Bed Combustion Process (FBC). These efforts have contributed to the National Fluidized Bed Combustion Program, an interagency program coordinated by the Energy Research and Development Agency (ERDA). EPA's contributions to the interagency program consist of environmental assessments of FBC systems, which control SO_x, NO_x, fine particulates, and other pollutants, and continued testing of its small (0.63 megawatt) FBC mini-pilot plant. The Agency also conducts independent research to determine the implications of alternative designs and of alternative uses of fluidized bed combustors.

Another important atmospheric emission point source of sulfur oxides is the primary copper smelter's reverberatory furnace. The Office of Research and Development is currently evaluating various abatement technologies that can be applied to this source of low and variable SO_2 concentration.

NITROGEN OXIDES (NO_x)

Combustion modification is the primary control technique for preventing or minimizing NO_x emissions from fossil-fuel burning. The technique is applicable to utility and large industrial boilers; small industrial, commercial and residential systems; industrial process furnaces and afterburners; stationary engines; and advanced fuel processes.

Several combustion modification techniques have been developed or are under study. EPA-supported and directed efforts have shown that staged combustion is an effective method of controlling NO_x originating from the oxidation of atmospheric nitrogen and nitrogen found in fuels. Flue gas recirculation is an effective technique for controlling NO_x emissions originating from thermal fixation of atmospheric nitrogen during the combustion of clean fuels. Additional EPA research and development efforts aim to modify combustion by redesigning burner/combustor systems, to investigate novel approaches to combustion modification (such as catalytic combustion, advanced power cycles, and alternative fuels), and to provide a basic understanding of the physical and chemical factors influencing the formation and degradation of nitrogen oxides.

Flue gas treatment (FGT) is another technique under investigation as a highly-efficient means of controlling NO_x emissions from stationary sources. EPA will draw on the knowledge gained in Japan's now-active development of FGT.

Finally, in the industrial area, EPA is currently supporting a project to evaluate and demonstrate NO_x control by a commercial molecular sieve process on tail gases from nitric acid plants. The molecular sieve process is capable of economically limiting NO_x concentrations to at least 100 ppm, and quite possibly to 50 ppm, on tail gases from absorbers in nitric acid production.

PARTICULATES

Control technology for large particulates has been well established. EPA's efforts now are mainly concerned with development of techniques for the control of fine particulates. These small particles, less than three microns in diameter, remain suspended in the atmosphere and are easily respirable and absorbable by the body. One current program seeks to improve the definition of the physical and chemical character of fine particulates. Control technology for fine particulates is still seriously deficient. The Agency's present efforts center in developing adequate detection and measurement methods and in developing and field testing of control methods. Additionally, EPA is working to improve and demonstrate existing collection capability for fine particulates control and to identify and ultimately to demonstrate novel techniques which will offer both economic and performance advantages over current methods.

OTHER POLLUTANTS

Control technology research and environmental assessment efforts are underway for a number of pollutants, including trace metals, polycyclic organic matter and hydrocarbons, and fluorides. Several tasks are being funded for the field testing of coal-fired utility and industrial boilers and for limited source characterization of gas- and oil-fired units to assess pollutant emission levels. A field testing program is underway for residential and commercial units as well.

Source assessment is also underway for certain chemical processing industries. The objective of this program is to characterize the environmental impact of sources of toxic and potentially hazardous emissions from the organic and inorganic materials production, combustion and other source categories and to determine the need for control technology development. Specific sources under assessment include petroleum refining, petrochemicals, nitrogen fertilizer operations, phosphate fertilizer operations pesticides manufacturing, and textile operations.

EPA has completed development at the pilot plant level for ethylene dichloride plants and odor control for the rendering industry. An extensive testing program is underway to evaluate shipboard incineration of organic chemical wastes as a disposal technique. The first phase of a test program designed to resolve the uncertainties in cost estimates for gasoline station hydrocarbon control systems is nearly completed.

Control technology for the ferrous metals industry is under continuing development. EPA has completed projects directed toward the control of emissions from coke making, blast furnace tapping, and the charging of basic oxygen furnaces. Work is underway to develop technology for the control of emissions from the sintering of iron ore. Extensive efforts are underway to assess, and ultimately to bring under control, fugitive emissions from all significant sources in the production of ferrous products.

VII. CONTROL OF MOBILE SOURCE EMISSIONS

INTRODUCTION

Title II of the Clean Air Act mandated at least 90 percent reductions in carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NO_x) emissions from light-duty vehicles and engines and gave the Administrator authority to prescribe certain other emission standards for automobiles, trucks, and planes.

MEASURES TAKEN TO IMPLEMENT MANDATED TITLE II EMISSION STANDARDS

Emission Standards Development

As a result of the 1970 amendments, standards of 0.41 gram per mile (g/mi) HC, 3.4 g/mi CO, and 0.4 g/mi NO_x were promulgated on July 2, 1971, for those pollutants. The HC and CO standards were to be met by the 1975 model year and the NO_2 standard was to be met by the 1976 model year.

The 1970 amendments provided that motor vehicle manufacturers could apply for a one-year suspension of these standards. Application was made by manufacturers in March 1972 to suspend the HC and CO standards. After an initial suspension denial by EPA, the U.S. Court of Appeals for the District of Columbia required EPA reconsideration and on April 11, 1973, EPA granted a suspension for the 1975 model year. At this time interim standards of 1.5 g/mi HC and 15 g/mi CO were established.

Further action was taken on July 30, 1973, when the 1976 model year statutory NO_x standard of 0.4 g/mi was suspended for one year and an interim standard of 2.0 g/mi was established.

In June 1974 the passage of the Energy Supply and Environmental Coordination Act (ESECA),which amended portions of the Clean Air Act, provided that (1) the 1975 Federal motor vehicle interim standards would also be applicable to the 1976 model year, (2) the original statutory standards for HC and CO of 0.41 and 3.4 g/mi, respectively would be applicable to the 1977 and subsequent model years, (3) the interim NO_x standard of 2.0 g/mi would be applicable to the 1977 model year, (4) the original statutory NO_x standards of 0.4 g/mi would be applicable to the 1978 and subsequent model years, and (5) any motor vehicle manufacturer could, after January 1, 1975, apply for a one-year suspension of the imposition of the statutory HC and CO standards for the 1977 model year.

On March 5, 1975, after extensive hearings, the EPA Administrator granted the request of Ford Motor Company, General Motors Corporation, and Chrysler Corporation for a one-year suspension of the 1977 motor vehicle emission standards. The basis for the suspension was that the catalyst technology, needed to reduce HC and CO emissions to the required levels, also increased the conversion of sulfur in gasoline into sulfuric acid. At the time an estimate was made of potential public health impacts attributable to cars equipped with oxidation catlysts with air pumps which indicated that unacceptable levels of sulfate concentrations would be reached before a full inventory of these cars were on the roads. Additonally, the catalyst technology needed to meet the ultimate statutory standards was relatively new and undeveloped. With these problems in mind, the Administrator imposed 1.5 g/mi HC and 15 g/mi CO as interim standards for 1977 and recommended to the Congress standards of 1.5 g/mi HC, 15 g/mi CO and 2.0 g/mi NO_x for the 1978 and 1979 model years, and 0.9 g/mi HC, 9.0 g/mi CO and 2.0 g/mi NO_x for the 1980 and 1981 model years. He also recommended that the original statutory standards for HC and CO of 0.41 g/mi and 3.4 g/mi, respectively, go into effect for the 1982 model year. The 1982 NO_x standard was recommended to be administratively established.

From March 1975 through the end of 1976, Congress considered the auto emission standards issue, and EPA provided, upon request by the Congress, numerous technical analyses of the feasibility and fuel economy impact of various stringency levels of standards.

On August 5, 1976, the Senate passed a bill (S. 3219) to amend the Clean Air Act which dealt with the question of auto emission standards for the 1978 model year and beyond. The Senate bill would have extended the existing 1977 auto emission standards of 1.5 g/mi HC, 15 g/mi CO and 2.0 g/mi NO_x for one additional year, through model year 1978. For the model year 1979 and thereafter the bill would have imposed the original statutory standards of 0.41 g/mi HC and 3.4 g/mi CO, while requiring 90 percent of each manufacturer's cars sold to meet a 2.0 g/mi NO_x standard and the remaining 10 percent of cars sold to meet a 1.0 g/mi NO_x standard. By the 1980 model year all cars would have been required to meet the 1.0 g/mi NO_x standard. The original statutory standard of 0.4 g/mi NO_x would have remained a mandatory research objective of the industry. The House of Representatives passed a different bill on September 14, 1976, which would have adopted an emission reduction schedule consistent with the recommendation of the EPA Administrator.

A Conference Committee bill of September 30 would have extended the existing 1977 auto emission standards of 1.5 g/mi HC, 15 g/mi CO, and 2.0 g/mi NO_x to model year 1978, and deleted the Senate bill requirement that 10 percent of all cars meet the 1.0 g/mi NO_x standard by 1979, as well as the requirement that all cars meet the 1.0 g/mi NO_x standard in 1980. In short, the conference bill provided that standards of 0.41 g/mi HC and 3.4 g/mi CO be met by model year 1979, a NO_x standard of 2.0 g/mi for 1979 and 1980, and a 1.0 g/mi NO_x standard for 1981. The conference bill retained the 0.4 g/mi NO_x standard as a mandatory research objective. However, Congress recessed on October 2, 1976, without adopting the Conference Committee bill. Hence the present motor vehicle standards are those first established by the EPA Administrator in April of 1973 for the 1975 model year and extended by ESECA and the EPA Administrator for the 1976 and 1977 model years. The present motor vehicle standards are presented in Table VII-1.

Certification Testing

Certification of new passenger cars for compliance with Federal emission standards began with 1968 model year vehicles. The program includes testing of prototype vehicles that represent all new motor vehicles sold in the United States.

The manufacturer is required by EPA to submit data from two types of tests which evaluate vehicle conformance to Federal emission standards. First, through the Durability Fleet Test, fleets are tested at 5000 mile intervals up to 50,000 miles to determine the deterioration of the emission control system. Second, through the Emissions Fleet Test, prototype fleets are tested at 4000 miles to determine their emissions at close to the "break in" point. To check manufacturers' data, EPA requires that a vehicle being tested by the manufacturer for durability be brought to the EPA laboratory in Ann Arbor, Michigan, for confirmatory tests. All emission data vehicles are tested in the EPA laboratory.

During the past year, certification of most 1977 model year light duty vehicles, light duty trucks, and heavy duty engines was completed and certification of 1978 models began. The certification program for the 1977 model year involved monitoring the test program of approximately 50 manufacturers, reviewing durability data from approximately 500 vehicles and engines, and

Table VII-1. EMISSION STANDARDS FOR MOTOR VEHICLE CLASSES

Motor vehicle class	1977			1978			1979		
Light duty passenger	HC	CO	NO_x	HC	CO	NO_x	HC	CO	NO_x
(Emissions expressed in grams per mile)									
National	1.5	15	2.0	0.41	3.4	0.4	0.41	3.4	0.4
California	0.41	9.0	1.5						
Light duty trucks	HC	CO	NO_x	HC	CO	NO_x	HC	CO	NO_x
(Emissions expressed in grams per mile)									
National	2.0	20	3.1	2.0	20	3.1	1.7	18	2.3
California	0.9	17	2.0	0.9	17	2.0	0.9	17	2.0
Heavy duty vehicles[a]	HC + NO_x	CO	Smoke	HC + NO_x	CO	Smoke	HC + NO_x	CO	Smoke
(Emissions expressed in grams per horsepower-hour)									
National	16	40	15/20/50[b]	16	40	15/20/50[b]			
California	1[c]	25	7.5[c]	1[c]	25	7.5[c]			

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[a] Gasoline and diesel have same standards but are tested under different procedures.

[b] Diesel only; lugging/acceleration/peak.

[c] Option available for combined HC and NO_x standard of 5 grams/brake horsepower/hour.

reviewing emission data from almost 7000 vehicles and engines. To reach this level of certification, EPA conducted approximately 2900 emission tests on 1977 light duty vehicles, light duty trucks, and heavy duty engines.

By June of 1976 it was necessary for manufacturers to begin to prepare applications for certification of 1978 model year vehicles. Because Congress was still considering a change in the 1978 standards at that time, the manufacturers requested guidance concerning the certification procedure. The EPA Administrator advised the automobile industry that EPA would accept applications for cars designed to meet whatever emission control levels each individual company estimated might result from the Congressional deliberations. However, the EPA Administrator informed the companies that in submitting such applications they were operating entirely at their own risk because EPA could not issue 1978 Certificates of Conformity for cars that did not meet the statutory 1978 standards, unless such standards were changed by the Congress by the time issuance of certificates would be requested.

In addition to the requirements for certification of motor vehicles and engines prior to mass production, EPA has regulations governing changes to vehicles and engines during production. Approximately 1500 tests were conducted during the past calendar year to determine emission compliance of modified versions of certified vehicles.

Since the 1971 model year, emission test results have been published in the Federal Register. Beginning with the 1973 model year, fuel consumption during the emission test has also been determined and published in the Federal Register. Beginning with the 1974 model year a "Gas Mileage Guide" listing the comparative fuel economy of all new model vehicles has been prepared by EPA and distributed by the Federal Energy Administration (FEA) for consumer use. During 1976 EPA tested about 750 vehicles to determine their economy rates. Three figures were obtained for each vehicle: a cold-start city mileage figure, a highway mileage figure, and a combined city-highway mileage figure. EPA thus provides emission test results and a broad picture of fuel economy test results for consumers who are concerned with both air quality and fuel economy.

Fuel economy over the last several model years has increased significantly. The estimated average fuel economy of all cars in the 1974 model year was 13.9 miles per gallon (mpg). In 1975, the average increased to 15.6 mpg. In 1976 it was 17.6 mpg, and 1977 model year cars are expected to average 18.6 mpg. The 1977 estimate represents a 34% increase over 1974 models. The increase is due primarily to changes in calibration made possible by the use of catalytic emission controls and by shifts to lighter weight vehicles.

MOTOR VEHICLE EMISSION REGULATIONS--ACTIONS TAKEN IN 1976

Motorcycle Regulations

Motorcycles are small but collectively significant sources of emissions. The average uncontrolled motorcycle presently emits about twice as much CO and about six times as much HC as permitted by 1977 automobile standards.

Both interim and longer term emission standards for motorcycles designed for street use were promulgated by EPA in 1976. The 1978-1979 interim standard for HC exhaust emissions is dependent upon engine displacement, requiring control to 5 grams per kilometer (g/km) for motorcycles with up to 170 cubic centimeters (cc) displacement. The standard increases proportionately with displacement, from 5 g/km required at 170cc to 14 g/km required at 750cc. Motorcycles with displacements above 750cc are held to the 14 g/km standard regardless of size. CO emissions are limited to 17 g/km regardless of size. No standard for oxides of nitrogen has been promulgated because a 1976 air quality analysis indicated that the motorcycle contribution to motor vehicle NO_x emissions is negligible, estimated to be less than one-half of one percent in 1990.

The promulgated long-term emission standards for the 1980 model year will be 5 g/km HC (regardless of engine displacement) and 12 g/km CO.

Crankcase emissions are prohibited under both the interim and long-term emission standards. Studies have shown that if crankcase emissions are eliminated entirely, then average motorcycle emissions of HC will decrease by 30 percent and CO emissions will decrease by 22 percent.

Revised Light Duty Truck Regulations

A need for stricter light duty truck regulations developed because, as increasingly stringent controls are placed on passenger cars, the percentage of total vehicular pollution caused by trucks increases in significance. Air quality analyses forecast that if no further controls were placed on light duty trucks used in urban areas and if current statutory control of light duty vehicles were effected, CO and NO_x emissions from light duty trucks would equal light duty vehicle emissions by 1985.

Regulations were proposed in February of 1976 and promulgated in December of 1976 to expand the definition of the light duty truck class to an 8500 pound gross vehicle weight limit rather than the present 6000 pound limit. This action groups together trucks with similar design and operating characteristics so that emissions standards can be imposed in a cost-effective manner. It also imposes relatively stricter emission controls on trucks within the 6000-8500 pound weight range which account for more and more of urban air pollution as light duty vehicle emissions regulations become more stringent.

The February 1976 regulations also proposed more stringent emission standards for light duty trucks, beginning with the 1978 model year. These standards, 1.7 g/mi HC, 18 g/mi CO, and 2.3 g/mi NO_x, are equal in stringency to the 1977 model year light duty vehicle standards. EPA in response to comment which identified compliance problems extended the effective date of the regulation to 1979 model year vehicles.

Heavy Duty Vehicle Emissions Regulations

In May of 1976 a notice of proposed rulemaking was published for more stringent control of gaseous exhaust emissions from heavy duty gasoline and diesel powered vehicles, beginning with the 1979 model year. The proposed standards are 1.5 g/BHP-hr (grams per brake horsepower-hour) HC, 25 g/BHP-hr CO, and 10 g/BHP-hr HC plus oxides of nitrogen. The reason for the combined hydrocarbon plus oxides of nitrogen standard is to give the manufacturers some leeway. They can either reduce HC emissions more than the HC standard and emit more NO_x, or they can barely make the HC standard and emit less NO_x. Additionally, a Diesel engine peak smoke opacity standard of 35 percent instead of the present 50 percent has been proposed to prevent degradation of on the road smoke levels as a result of changes in gaseous emissions standards.

Stricter emission standards for heavy duty vehicles are necessitated by the inability of some Air Quality Control Regions (AQCR) to meet national ambient air quality standards without further control of HC, CO, and NO_x. Although the heavy duty vehicle population accounts for only approximately 5 percent of all registered motor vehicles, the levels of HC, CO, and NO_x

that they emit are significant. It is estimated that without further controls, emissions from heavy duty vehicles by 1990 will exceed those of light duty vehicles controlled to the level of the statutory standards.

Revised Evaporative Emission Regulations

More stringent standards for evaporative emissions from light duty passenger vehicles and light duty trucks were promulgated in August of 1976. The new standard promulgated for the 1978 model year, 6 g/test, appears at first to be higher than the old 2 g/test standard, but,because of inadequacies in the former standard's test procedures, it is estimated that evaporative hydrocarbons emissions will be reduced from about 1.76 g/mile to 0.6 g/mile when manufacturers are required to demonstrate compliance with the 6 g/test standard by the new test procedure. This action is expected to reduce nationwide HC emissions from all mobile sources by as much as 46 percent by the year 1990 from the level that would have been emitted at the former level of control of evaporative emissions.

Aircraft Emissions Regulatory Actions

EPA promulgated in August of 1976 regulations limiting emissions from currently certified SST aircraft manufactured after January 1, 1980, and more stringent emission standards for SST aircraft that are newly certified after January 1, 1984. By 1990, the 1980 and 1984 standards are expected to account for a 61 percent reduction in HC and a 50 percent reduction in CO emissions at an airport where SST aircraft are used.

Another aircraft emissions regulatory action promulgated late in 1976 was an extension to the compliance date for smoke emissions standards applicable to the JT3D engine (commonly used in Boeing 707s and DC-8s). The extension from January of 1978 to September of 1981 was in response to a petition by the Air Transport Association (ATA). The manufacturers claimed in the petition that durability problems had developed during tests of the low smoke combustor which could not be overcome within the necessary time frame and, additionally, that EPA had significantly underestimated the cost of this retrofit program and its impact on the airline industry. EPA, in granting the extension, added an additional requirement that each operator of aircraft powered by JT3D engines achieve 90 percent compliance by September of 1980. The 90 percent by 1980 requirement was added to lessen the impact of the extension and force continued effort to develop technology required to meet the full standard. The environmental impact of the completed program is expected to be a reduction in visible smoke, and HC and CO emissions reductions of 32 percent and 13 percent, respectively, from total commercial aircraft emissions in exchange for a modest 5 percent increase in NO_x.

In January 1976, public hearings were held to receive comments on proposed regulations concerning new turbine aircraft in 1979 and retrofitting existing turbine engines beginning in 1981. These comments have been reviewed, a revised turbine technology assessment report has been prepared, and modifications to the regulations are expected to be proposed in 1977.

AUTO FUEL ECONOMY REGULATIONS

Under authority of the 1975 Energy Policy and Conservation Act, EPA in 1976 changed the automobile fuel economy labeling from a voluntary program to a mandatory requirement. Beginning in March 1976, all new automobiles, at the time they are offered for sale, must carry a label disclosing the fuel economy of the vehicle, the average annual fuel cost for operating the vehicle, and the range of fuel economy estimates for comparable automobiles.

Additionally, car dealers are required to display in their showrooms copies of the current model year "Gas Mileage Guide," a pamphlet prepared by EPA and distributed by the FEA. These two measures will make information on the fuel economy performance of new automobiles readily available to prospective buyers.

The Energy Policy and Conservation Act of 1975 also requires EPA to establish and promulgate test procedures for calculating an average fuel economy for each automobile manufacturer's product line. These manufacturer's average fuel economy values will be used by the Secretary of Transportation to determine compliance with the minimum fuel economy standards defined in the Act (e.g., 18 MPG by 1978, 27.5 MPG by 1985). EPA generates city fuel economy data as a by-product of its emission test program at no additional costs and generates highway fuel economy at a minimal incremental level of effort. Relatively few cars that would not otherwise be tested for emissions need to be added to the testing program for fuel economy measurement purposes. In September of 1976 EPA promulgated fuel economy testing and calculation procedures for the 1978 model year and proposed procedures for 1979 and subsequent model years.

A third requirement of the Energy Policy and Conservation Act is that EPA establish procedures for testing retrofit devices submitted by manufacturers which might enhance automobile fuel economy. A proposal for such a testing procedure will be forthcoming early in 1977.

COST OF MEETING EMISSION STANDARDS

Passenger Vehicles

Emission Control Equipment, 1977 Model Year -- With the setting of interim 1977 standards for hydrocarbons (HC) and carbon monoxide (CO) at the 1975-76 levels and nitrogen oxide (NO_x) at a level of 2.0 g/mile (which is 35 percent lower than the 1975-76 level), the automobile companies are able to meet the 1977 standards with only minor modifications to engines and control devices. These modifications include increased use of secondary air for catalyst operation, improved exhaust gas recirculation, ignition timing modification, and modified catalysts with decreased use of secondary air. EPA has estimated that the incremental cost to meet 1977 emission standards is $15.

Emission Control Equipment, 1978 Model Year -- Because the 1978 Federal emission standards call for considerably lower HC, CO, and NO_x levels than the 1977 values, additional control technology will be required. The capability of many different systems to achieve the 1978 emission standards has been investigated; some of these systems involve the use of alternative engines (noninternal-combustion Otto cycle, such as Rankine cycle, Brayton cycle, Diesel, Stirling). However, insufficient lead time remains to mass produce a significant number of passenger cars powered by alternative engines for the 1978 model year. Furthermore, no vehicle powered by an alternative engine has yet demonstrated the capability to meet all of the requirements of the Clean Air Act.

Several systems that are applicable to modified conventional internal-combustion engines have demonstrated the capability to meet the emission levels required for 1978 at low mileage. These include:

- Dual catalysts (nitrogen oxide reduction with advanced oxidation catalyst)
- Three-way catalysts with feedback controls
- Stratified charge engine with oxidation catalyst
- Thermal reactors plus nitrogen oxide reducing catalyst

At this time, the dual and three-way catalyst systems have received the most attention and are considered the most advanced of the above options.

Additional changes that might be used for the 1978 model year include addition of fuel evaporation techniques and use of proportional exhaust-gas recirculation. Estimates of the incremental initial-equipment or engine modification costs per car for emission control for the 1978 model year are $220 (EPA), $145 (National Academy of Sciences) and $35-$480 (Industry). However, as was discussed previously in this chapter, applicable standards for the 1978 model year are still in question and appropriate cost estimates are dependent upon the resolution of this question.

Summary of Estimated Emission Control Equipment Costs -- Table VII-2 summarizes EPA's estimates for incremental cost increases per car due to emission control requirements for the period 1968 to 1980.

Estimated Maintenance Costs Due to Emission Controls -- The additional per vehicle maintenance costs attributable to emission-control devices has been estimated by EPA to be $16 per year from model years 1968 through 1974. For the 1975, 1976, and 1977 model years, there are certain benefits in reduced maintenance costs derived from the use of high-energy ignition systems, long-life exhaust systems, and unleaded fuel. For the 1975-77 model years, the annual maintenance cost benefits are estimated to be $23 per catalyst-equipped car over 1974 cars; thus, the net maintenance cost over the pre-controlled cars is a $7 benefit.

Additional maintenance costs are anticipated for the 1978 through 1980 model year period because of the greater complexity expected in the emission control systems required to meet the lower hydrocarbon and carbon monoxide standards. This increase over 1975 cars is estimated to be $8 per car, resulting in a net annual-maintenance cost of $1 per car, or about the same as pre-controlled cars.

Table VII-2. ESTIMATED PASSENGER CAR EMISSION-CONTROL EQUIPMENT COSTS, 1968-1980 MODEL YEARS

Model Year	List Price
Cumulative costs through 1974	100
1975/76 incremental costs	100
1977 incremental costs	15
1978 incremental costs	220
Cumulative costs through 1980	435

Fuel Consumption Penalties

The average fuel economy of motor vehicles decreased gradually from the 1968 through the 1974 model cars. This change can be attributed to variations in vehicle weight, engine size, optional equipment, and the effects of emission-control equipment. In particular, the specific emission-control measures that adversely affect fuel consumption are retarded ignition timing, reduced compression ratio, and exhaust-gas recirculation.

Catalytic systems on most 1975 vehicles resulted in fuel economy superior to 1973 and 1974 model-year cars. The EPA-measured fuel economy data for 1975 certification vehicles, when weighted for the estimated vehicle sales, resulted in a gain of 13.5 percent over 1974 models, or a slight fuel economy benefit over pre-1968 baseline data of approximately 1.0-2.0 percent.

An additional fuel economy improvement was shown in the 1976 model year, resulting in an estimated fuel economy gain of about 12.8 percent over pre-1968 cars. An additional 5.6 percent gain in fuel economy was shown in the 1977 model year despite the increased severity of the NO_x standard, which dropped from 3.1 to 2.0 g/mile.

If statutory emissions standards are to be achieved for the 1978 model year automobiles, it is believed that meeting the more stringent HC, CO, and NO_x standards will result in anywhere from a 15 percent gain to a 20 percent fuel economy loss over 1976 cars.

Light-Duty Trucks

Beginning with the 1975 model year, less stringent standards were set for light-duty trucks than for passenger cars. However, most manufacturers elected to use catalyst systems for light-duty trucks anyway, at a cost similar to that for the passenger car ($210 per truck). Standards were promulgated during 1976 which imposed more stringent standards for light-duty trucks and expanded the upper weight limit of the class from 6,000 to 8,500 pounds. The standards become effective beginning in the 1979 model year. Trucks under 6,000 pounds will be able to meet the more stringent standards at no additional cost. Trucks from 6,000 to 8,500 pounds will be required to use catalyst systems to meet the standards, at a cost of $210 per truck. No impact on fuel economy or on maintenance costs is anticipated.

Heavy-Duty Gasoline Engine Controls

The 1974 through 1978 control equipment costs are equivalent to that for a 1973 passenger car engine, less the cost of EGR and evaporative controls, or $50.00 per vehicle. Fuel consumption penalties are estimated to be five percent to meet the 1974-1978 standards.

The expansion of the light-duty truck class to 8,500 pounds beginning with the 1979 model year will significantly reduce the number of engines subject to the heavy-duty standards. Furthermore, more stringent standards have been proposed for heavy-duty engines beginning with the 1979 model year. These standards will require the use of EGR, air injection, and deceleration throttle control, at a cost of $110 per engine. A slight fuel economy penalty may be experienced on some vehicles.

Heavy-Duty Diesel Engine Controls

No national cost penalty has been attributed to the 1974 heavy-duty Diesel engine standards, which will remain in effect through the 1978 model year. More stringent standards have been proposed beginning with the 1979 model year which will require the use of advanced fuel injection systems. The cost of these standards is estimated to be $120 per engine. A slight fuel economy penalty may be experienced on some vehicles.

Motorcycles

Standards have been promulgated for motorcycles beginning with the 1978 model year. To meet these standards manufacturers will use improved carburetion systems and high energy ignitions. In 1980 more stringent standards will become effective which will require the conversion of many medium and large two-stroke engines to four-stroke designs.

The emission control techniques used to meet the 1978/79 standards will increase the cost of motorcycles by an average of $47. This cost is offset by a fuel economy benefit of 20 percent over uncontrolled configurations for a net cost increase of $14. In 1980 the costs of motorcycles may increase another $18 but be offset by a fuel economy improvement of 28 percent over uncontrolled, for a net cost increase of $9.

EMISSIONS FROM VEHICLES IN USE

Emission Factor Program

In order to determine the emission performance levels of in-use vehicles at varying mileage and age intervals after such vehicles are subjected to actual owner use and maintenance, EPA in 1971 began an Emission Factor Program. The collected emission data are critical to the various air quality models used by Federal, state, and local agencies to predict ambient air quality. Each year emission data are gathered from a random sample of approximately 2000 in-use vehicles in approximately six U. S. cities. The vehicles are all tested in an as-received condition, i.e., as maintained by their owners upon delivery for testing.

The study completed in 1976 (termed the FY 74 Emission Factor Program was the most comprehensive and the most representative to date. Vehicles were tested in Chicago, Houston, Los Angeles, St. Louis, Washington, D. C., Denver, and Phoenix. It was also the first monitoring of in-use 1975 model year cars of which 70 percent utilized catalyst technology to control emissions. Of the 1975 model year vehicles tested in the 5 low altitude, non-California cities, 70 percent passed the 1975 HC standard, 51 percent passed the CO standard, 79 percent passed the NO_x standard, and 37 percent passed all three standards. The mean CO emission level was 29.43 g/mi, almost double the 15 g/mi CO standard for 1975.

Emission results in California were far better than the rest of the nation. In Los Angeles the average 1975 car tested emitted 56 percent less HC, 62 percent less CO, and 4 percent less NO_x than the average car in the other five cities.

Because of the demonstrated failure of relatively new cars to meet emission standards (the average accumulated mileage for 1975 cars tested was 9,000 miles), the EPA Administrator on July 20, 1976, sent a letter to the presidents of Ford, Chrysler, and General Motors, requesting them to take voluntary corrective action. The Administrator offered EPA's assessment of the most probable cause for the failure of these vehicles.

After receiving responses from the auto manufacturers to his letter of July 20, 1976, the Administrator sent a second letter on November 24, 1976, expressing his disappointment that "aggressive new action" had not been proposed by the industry to deal with the in-use problem. The Administrator asked that the manufacturers initiate a program of encouraging dealers to make available a quick, inexpensive emission test for each car serviced and that they tune up vehicles that do not meet the appropriate standards.

Restorative Maintenance Evaluation

After the results of the FY 74 Emission Factor Program had been analyzed, EPA determined that a further study was needed to precisely determine the reasons for the failure of model year 75 in-use vehicles to meet emissions standards. If engine maladjustment was the key reason, as the EPA Administrator had suggested in his letters to the manufacturers, then quantitative data were needed to choose the most effective correctional action.

In September of 1976 the Restorative Maintenance Evaluation Project (RMEP) was initiated to evaluate this problem. The basic design of the project is to test 100 randomly selected vehicles in each of four metropolitan areas (Washington, D.C., Chicago, Detroit, and San Francisco), following a four step procedure with each car proceeding to the next step only if it fails to meet emission standards. The procedural steps are as follows: (1) an initial emission test of the vehicles in an as received condition, (2) a test after correction of any obvious and visible signs of tampering with emission controls which may be detected, (3) a test after carburetor check and adjustment if necessary, and (4) a final test after extensive diagnostics, tune-up, and repair as necessary. This part of the project will yield data on whether cars can continue to meet emission standards if properly maintained. Preliminary test results have indicated that well over three-fourths of all cars tested meet all three emissions standards after the restoration of emission control components (test 4), while only about one-third meet the standards in an as-received condition (test 1). Final results of the study are due in February 1977.

ASSESSMENT OF MOBILE SOURCE TECHNOLOGY

Motor Vehicles-Current Technology and Future Trends

The number of vehicles equipped with catalysts has continued to increase, comprising 90 percent of 1977 model year vehicles. Approximately 85 percent of the 1976 model year vehicles had catalysts and for the 1975 model year the figure was 70 percent.

The desire for improved vehicle fuel economy has been the incentive for increased use of catalysts. The employment of catalysts allows the carburetor and distributor to be recalibrated for more optimal fuel economy.

Vehicles in the 1977 model year were also equipped with more sophisticated modulated exhaust gas recirculation (EGR) systems which provide NO_x control with lower performance penalties than were associated with earlier EGR systems. Manufacturers also used engine modifications (such as revised combustion chambers, air-fuel ratios and spark calibrations) to improve emissions. Fuel economy was improved in some 1977 models through changes in carburetion, weight reductions, improved transmissions, and electronic ignition.

Progress in emissions control technology development was demonstrated in several key areas. A three-way catalyst system was certified for use on 1977 model year Volvo cars. This system was extremely effective in controlling HC, CO, and NO_x emissions with excellent fuel economy performance and very low sulfuric acid emissions. At this time the three-way catalyst seems to be the most attractive technology for achieving statutory emission standards or other combinations of low emission levels.

A second area of accelerating research has been the development of all-electronic control systems for future automobiles. Some components that can be classified as electronic are already being used on vehicles today. Chrysler's ignition systems and the Electronic Fuel Injection (EFI) systems found on some foreign and a few domestic automobiles are examples. All-electronic control of engine parameters could be expected to permit significant improvements in emissions reductions, fuel economy, and driveability performance over current mechanically controlled emission control systems. Much work remains to be done in this area. Major unsolved problems include the development of inexpensive precise sensors and activators that will withstand the hostile automotive environment.

Improved warm-up emission control devices and heat conservation techniques are two additional areas of development. Warm-up emission control is an important area of concern because a disproportionate amount of HC and CO is emitted during a cold start. Improvements are being made presently in start-up fuel metering and in the use of start catalysts. Heat conservation techniques include port liners, low conductivity coatings, and thermal reactors. Their primary benefit is that they help maintain higher exhaust gas temperatures in the exhaust systems to promote more rapid light off of catalysts or reactors and additional oxidation of HC and CO during warmed up catalyst or reactor operation.

More precise and controllable fuel metering systems, considered to be a key element in almost every future emission control system, also received special attention in 1976. Electronic or mechanical fuel injection systems have received special interest from foreign manufacturers and some interest from the domestic ones. Work has been performed on advanced carburetion systems which may prove to be as good or better than today's multiple-point fuel injection systems. These advanced systems are being investigated for their feedback control potential and have promise for being integrated into electronic fuel metering systems for the future.

Characterization of Currently Unregulated Emissions and Alternative Automotive Fuels

Studies involving unregulated pollutants have continued through EPA contracts and in-house testing. Such unregulated pollutants as platinum, nickel compounds, nitrogen compounds, sulfur compounds, and polynuclear aromatics, first emphasized as potential problems in 1975, continued to be studied in 1976. Additionally, new contracts have been awarded to study hydrogen cyanide (HCN) emissions from three-way catalysts (at this point, HCN levels are not considered significant, but further testing is warranted to confirm the preliminary results), diesel engine exhaust particulates, and diesel crankcase emissions.

The phase-down of the use of lead anti-knock additives in gasoline and the requirement for lead-free gasoline by catalyst systems has resulted in the introduction and expanding use of manganese octane improver additive in lead-free motor fuels. Concern over potential effects of this fuel additive upon emission control system performance and durability prompted EPA to initiate contract studies in this area. Further, the automotive and petroleum industries have been put on notice that more data are required to address the EPA concern and that certification durability fuel will be required to contain manganese starting with 1979 model year certification.

EPA has also continued to study the environmental consequences of using alternative automotive fuels. Earlier investigations had determined that methanol from coal and distillate-like fuels from coal and oil shale were the most economically feasible alternative fuels for the years 1980 to 2000. Contracts were awarded in 1974 and 1975 to study the environmental implications to the motor vehicle fleet of these two possibilities, and work continued on both in 1976. Additionally, a new contract was awarded in 1976 to test the emission levels from light-duty diesels when various fuels are utilized. These fuels would be representative of petroleum blends that would be energy efficient and optimized from the diesel fleet/refinery overall energy balance.

Aircraft

Studies have continued in support of the regulations which EPA has promulgated limiting the emissions of CO, HC, NO_x, and smoke in commercial and private aircraft. Current efforts are concentrated in the following areas: (1) improvement of the precision of the emission sampling and measurement techniques specified in the EPA regulations; (2) assessment of progress by private industry and other government agencies in development of techniques for reducing emissions from turbine-powered aircraft; and (3) assessment of progress by private industry and other government agencies in development of techniques for reducing emissions from piston engine-powered general aviation aircraft.

In conducting the above programs, maximum advantage is taken of ongoing efforts by other Federal agencies active in the aircraft emission area. These are principally the National Aeronautics and Space Administration, the United States Air Force, and the Federal Aviation Administration (FAA).

In particular, the FAA has started a new High Altitude Pollution Program (HAPP) to investigate further the unique emission effects which high-flying aircraft may have when operating in the stratosphere. EPA is participating in an advisory role in this work and will assess from the experimental findings whether aircraft regulations already promulgated require modification to respond to upper atmosphere problems.

Sulfuric Acid Emissions From Catalyst-Equipped Vehicles

As part of his March, 1975 decision to suspend the implementation of more stringent HC and CO emission standards for the 1977 model year, the EPA Administrator directed the development and proposal of a sulfuric acid emission standard for light duty vehicles. Targeted for the 1979 model year, the standard was intended to prevent any adverse public health effects which might result from the sulfuric acid emissions of catalyst-equipped cars.

Since that time intensive study of the sulfuric acid emissions problem has been carried out. The primary focus of this research has been to determine how much control of sulfuric acid emissions may be necessary to protect the public health, the most effective regulatory procedures for ensuring the achievement of that control, and assessment of the technologies available to both minimize sulfuric acid emissions from the catalyst-equipped motor vehicle and the amount of sulfur contained in current motor fuels.

The results of these studies and others performed by industry have indicated that the sulfuric acid emission rates for current (1975 and 1976) non-California models are substantially lower than was estimated earlier, and that the initially higher sulfuric acid emission rates of cars designed to meet the more stringent California HC and CO standards may decrease substantially and rapidly as the vehicles' catalysts age with mileage accumulation. For this reason EPA has estimated that average light duty vehicle sulfuric acid emission rates over the next few years will be lower than had been estimated at the time of the March 1975 suspension decision.

In view of these encouraging results from research on sulfuric acid emission levels and the fact that uncertainty still remains in many key areas, EPA announced in April 1976 that it does not expect to propose a sulfuric acid standard in the immediate future, particularly not for 1979 model year vehicles. EPA studies of vehicle sulfuric acid emission rates, ambient exposures produced by those emissions, and possible adverse health effects of sulfuric acid exposure at levels automobiles might produce are continuing. It is expected that these studies will yield sufficient data so that in two years EPA can review again the sulfuric acid emission problem from motor vehicles and determine the need, based on technology in use and expected to be in use, for a vehicle sulfuric acid emission standard.

VIII. RESEARCH IN MONITORING INSTRUMENTATION AND QUALITY ASSURANCE

Methods to quantitatively detect pollutants in air are essential to EPA's abatement and control program. Initially, methods are needed to determine the extent and causes of a pollution problem and to investigate the health and welfare effects of the pollutants. When standards and implementation plans are promulgated, reference or compliance methods must also be promulgated for determining achievement and maintenance of the standards.

MONITORING DEVELOPMENTS

Stationary Source Emissions Measurement

Research related to the monitoring of stationary source emissions has produced a number of technological advancements during 1976. Monitors to measure chlorinated hydrocarbons (from solvent degreasing and commercial dry cleaning facilities), hydrogen sulfide in refinery fuel gas lines, and sulfuric acid mist have been developed and field tested. Previously developed monitors for nitrogen oxides and sulfur dioxide were successfully field-tested at nitric acid and sulfuric acid plants, respectively. New instruments to monitor in-stack particulates are being developed and tested. An uplooking, remote sensing instrument to measure SO_2 concentrations in plumes was developed and field tested. The ROSE (remote optical sensing of emissions) system was successfully used to measure carbon monoxide (CO) concentrations over path lengths up to 2 km at an airport. The Lidar system field test demonstrated that plume opacities could be optically measured.

Mobile Source Emissions Measurement

Research on methods to measure mobile source emissions has resulted in a number of important developments. Sampling and analytical procedures for SO_2 and sulfuric acid emissions from cars equipped with oxidation catalysts have been collaboratively evaluated and standardized. The technology has been transferred to many government and industrial laboratories. Developments concerning the presently regulated pollutants--nitrogen oxides, carbon monoxide, and hydrocarbons--include new methods to measure hydrocarbon emissions from passenger cars. Research efforts are presently underway to develop methodology for sampling and measuring hydrocarbons and nitrogen oxides in emissions from aircraft turbines, and hydrocarbon emissions from diesel engines.

A number of new techniques have been developed to study the emissions of other harmful pollutants that may be associated with newly developing catalyst technology. These pollutants include hydrogen cyanide, hydrogen sulfide, nitrosamines, nitrous oxide, and polynuclear aromatic hydrocarbons. In addition, new methods have been developed to assess particulate emissions from heavy and light duty diesel engines, which are being used more and more because of better fuel economy.

Ambient Air Measurement

Several important developments occurred during 1976 concerning instruments and techniques to measure ambient air pollutants. A new analytical technique has been used successfully to measure sulfates and nitrates.

The continuing research and application of gas chromatography/mass spectrometry for measuring trace concentrations of organic vapors has been a rewarding effort. The technique was used with much success to analyze for nitrosamines, halogenated hydrocarbons, and other carcinogens in samples collected during a number of field studies.

The dichotomous sampler for particulate matter was improved and further field testing was carried out; it is now being used in many field studies. The sampler overcomes the major shortcomings of high-volume samplers, namely, the inability to sample meaningfully for periods of less than 24 hours and to selectively sample for fine particles.

An improved version of a device to measure low levels of airborne sulfuric acid mist was successfully used to confirm the presence of sulfuric acid aerosol 20 meters downwind from a test roadway on which a fleet of catalyst-equipped vehicles was operating.

Several new instrumental systems were developed to measure ambient levels of a variety of pollutants, both man-made and naturally occurring. One system combined gas chromatography with an opto-acoustic instrument using a CO_2 laser. The system is useful in measuring gaseous pollutants, such as ammonia and freons, that have high infrared absorption coefficients.

An ultra sensitive flame photometric detector coupled to a precision calibration system was developed to measure sub-part-per-billion concentrations of gaseous sulfur compounds. Subsequent field studies indicate that this methodology can provide reliable background values for SO_2 and hydrogen sulfide.

Other developments include a modified potassium iodide ozone calibration method that appears to be more accurate and precise than the current Federal Reference Method and an ambient NO_2 monitor using flash-induced fluorescence that provides a direct measurement of NO_2.

EPA Designated Reference and Equivalent Methods

The Clean Air Act and Agency regulations require the establishment of an air quality monitoring system in each non-attainment Air Quality Control Region (AQCR). The state must develop a monitoring system which uses the designated Federal Reference Method or one which has been determined by EPA to be equivalent. Currently fourteen methods have been designated as Federal Reference Methods or equivalent methods (which include CO_2, CO, and oxidants).

Amendments have been proposed to replace the original reference method for NO_2 with a new reference measurement principle and its associated calibration procedure. A related amendment was also proposed to add NO_2 to the equivalency regulations. Both of these proposed amendments will be promulgated in the very near future. A notice was published in the Federal Register on October 6, 1976, announcing EPA's intent to evaluate several alternative calibration procedures for the reference method for ozone measurements.

Quality Assurance

The goal of EPA's quality assurance program is to improve and document the quality of environmental measurements, ensuring that data collected by or for EPA is of the highest quality. The program incorporates several major functions: standardization of measurement methods, distribution of standard reference materials, publication of procedures and guidelines, evaluation of on-going monitoring activities, laboratory performance evaluations, and training and technical assistance. A five year quality assurance plan has been developed by EPA covering the research and outputs which are needed to support current and projected air pollution measurement requirements.

The measurement method standardization function provides standardized and validated measurement systems which are needed to carry out currently mandated monitoring requirements, and to investigate non-regulated pollutants such as sulfates, nitrates, carcinogens, and other toxic and hazardous substances. Standardization involves the development of policies and procedures for testing and recommending reference methods, thorough evaluation of measurement systems in the laboratory and in field, and collaborative testing of methods by a group of typical users to determine the precision and accuracy of data that are produced under real operating conditions. Tables VIII-1 and VIII-2 list the ambient air quality and stationary source measurement methods which have been approved by the Agency or are currently under review.

Table VIII-1. Ambient Air Quality Measurement Methods

Tested		In Process	
Pollutant	Method	Pollutant	Method
Suspended Particulate	High-volume Sampler	Oxidant	Chemiluminescent
		Non-methane HC	Flame Ionization
CO	Non-dispersive Infrared	NO_3	Colorimetric
SO_2	Pararosaniline	SO_4	Colorimetric (automated)
SO_2	Flame Photometric		
NO_2	Chemiluminescent	SO_4	Colorimetric (manual)
NO_2	Sodium Arsenite	Arsenic	Atomic Absorption
NO_2	Triethylnolamine Guiacol Sulfite	Lead	Atomic Absorption
NO_2	Continuous Saltzman		

Other functions of the quality assurance program provide reference camples and materials that can be used to calibrate measurement sysatems and to audit performance of instruments and operators; reports of laboratory performance

VIII-2. Stationary Source Measurement Methods

TESTED		IN PROCESS	
Source	Pollutant (EPA Method Number)	Source	Pollutant (EPA Method Number)
Power Plants	Particulate (5)	Vinyl Chloride Production and PVC Fabricating Plants	Vinyl Chloride (106)
	SO_2 (6)		
	NO_x (7)		
	Opacity (9)	Petroleum Refineries	H_2S (11 modified)
Municipal Incinerators	Particulate (5)	Sewage Sludge Incinerators	Hg (105)
Cement Plants	Particulate (5)	Phosphate Fertilizer Plants	Fluorides (13)
	Opacity (9)		
Sulfur Acid Plants	SO_2/SO_3-H_2SO_4 Mist (8)	Aluminum Reduction Plants	Flourides (13)
Nitric Acid Plants	NO_x (7)	Various Sources	PCB's —
	Opacity (9)	Battery Manufacturing Plants	Pb —
Chlor-alkali Plants	Hg (101)		
Ceramic Plants	Be (104)		
Municipal Incinerators	Particulate (5 revised)	Copper Smelters	As —
		Sulfuric Acid Plants	SO_2/SO_3-H_2SO_4 Mist (8 revised)

and malfunctioning systems; and guidance and technical assistance to audit data and improve monitoring capabilities.

Reference samples or materials have been developed for seven pollutants: SO_x, NO_x, particulates (flow measurement), CO, sulfate, nitrate, lead, and arsenic. Inter-laboratory tests for regulated pollutants are conducted quarterly, semiannually, and upon demand.

IX. ENFORCEMENT

STATIONARY SOURCE ENFORCEMENT

Section 110 -- State Implementation Plans (SIPs)

The Clean Air Act establishes a stringent timetable for the states and EPA to abate air pollution. With a few notable exceptions (e.g. sulfur oxide emission limitations for Indiana and certain particulate and sulfur oxide limitations for Illinois), all states now have fully enforceable emission limitations for stationary sources which are the source of the large majority of particulate and sulfur oxide emissions.

To reach the target levels of air quality, state, local, and Federal enforcement programs have the responsibility for ensuring that stationary sources attain and maintain compliance with the SIP emission limitations. Enforcement responsibilities for state-developed, EPA-approved emission limitations are shared by the states and EPA. The Clean Air Act recognizes that states have primary responsibility for achieving clean air within their jurisdictions. When states do not enforce air pollution standards, however, the Act requires EPA to take action. In accordance with the intent of the Act, EPA's air enforcement program is designed to ensure that all sources achieve compliance with applicable standards. EPA bolsters state air enforcement efforts by supporting state agencies through control agency grants, by providing specialized skill and expertise or special contractual efforts, and by taking enforcement actions against selected sources when the states cannot or will not enforce.

Source Compliance Status -- Enforcement of standards for stationary sources is an immense task because more than 200,000 stationary sources are now subject to the SIP emission limitations. Nearly 22,000 of these are Class A emitters, a category defined as facilities individually capable of emitting more than 100 tons of a pollutant each year. As a class, these major sources produce about 85 percent of all air pollution from stationary sources. Enforcement programs have thus focused on ensuring compliance by Class A sources in order to achieve the greatest possible emission reductions in the shortest possible time frame.

Concentrated efforts expended in this area have resulted in a highly successful program. By September 1976, the states and EPA had identified 21,731 Class A sources and had brought 20,010 (92%) of these into final compliance or had placed them on firm schedules leading to compliance in the very near future. Of these, 18,466 major emitters were in final compliance and 1,544 were complying with cleanup schedules. Table IX-1 summarizes the compliance status of Class A emitters by EPA region. The compliance level is expected to climb to about 95 percent by the end of FY 1977.

In the 9-month period, January 1976 through September 1976, EPA conducted some 5,269 investigations, including plant inspections, opacity observations, emission tests, and compliance reports and initiated over 700 formal enforcement actions (Tables IX-2 and IX-3). At the same time, the states undertook clearly the largest portion of the compliance program, conducting the bulk of the total nationwide field investigation effort and initiating many thousands of enforcement actions to bring sources into compliance with SIP emission limitations.

A detailed listing of EPA enforcement actions dealing with stationary sources is published twice each year in EPA's semiannual State Air Pollution Implementation Plan Progress Report.

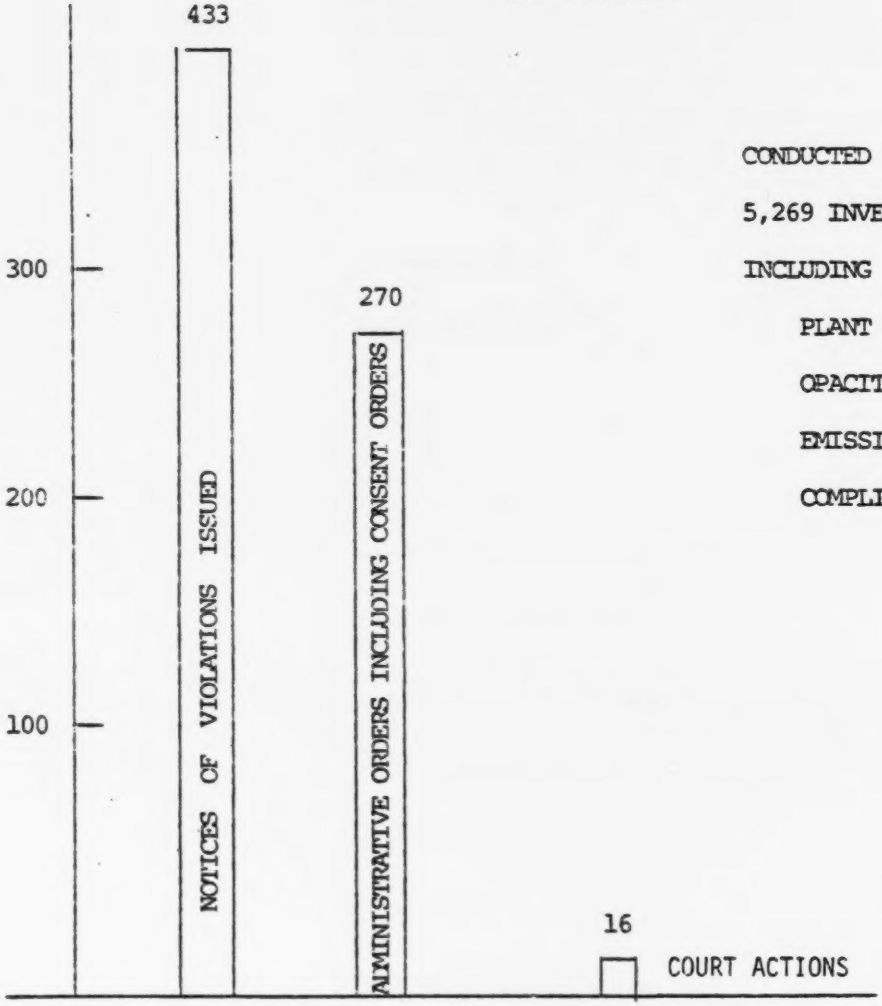
Table IX-1. COMPLIANCE STATUS OF CLASS A EMITTERS BY REGION
September 30, 1976

EPA Region	Total Class A Sources Identified	Compliance Status		
		Sources Complying With Standards Or Schedules	Sources Violating Standards or Schedules	Sources of Unknown Compliance Status
I	1156	1034	82	40
II	1822	1662	123	37
III	2750	2521	226	3
IV	4571	4104	452	15
V	4095	3690	351	54
VI	1916	1828	68	20
VII	1793	1660	35	98
VIII	641	601	37	3
IX	2178	2121	56	1
X	809	789	20	0
Total	21,731	20,010	1450	271

TABLE IX-2. STATIONARY SOURCE AIR POLLUTION ENFORCEMENT

JANUARY 1976 - SEPTEMBER 1976

(BY CATEGORY)



CONDUCTED

5,269 INVESTIGATIONS

INCLUDING

- PLANT INSPECTIONS
- OPACITY OBSERVATIONS
- EMISSION TESTS
- COMPLIANCE REPORTS

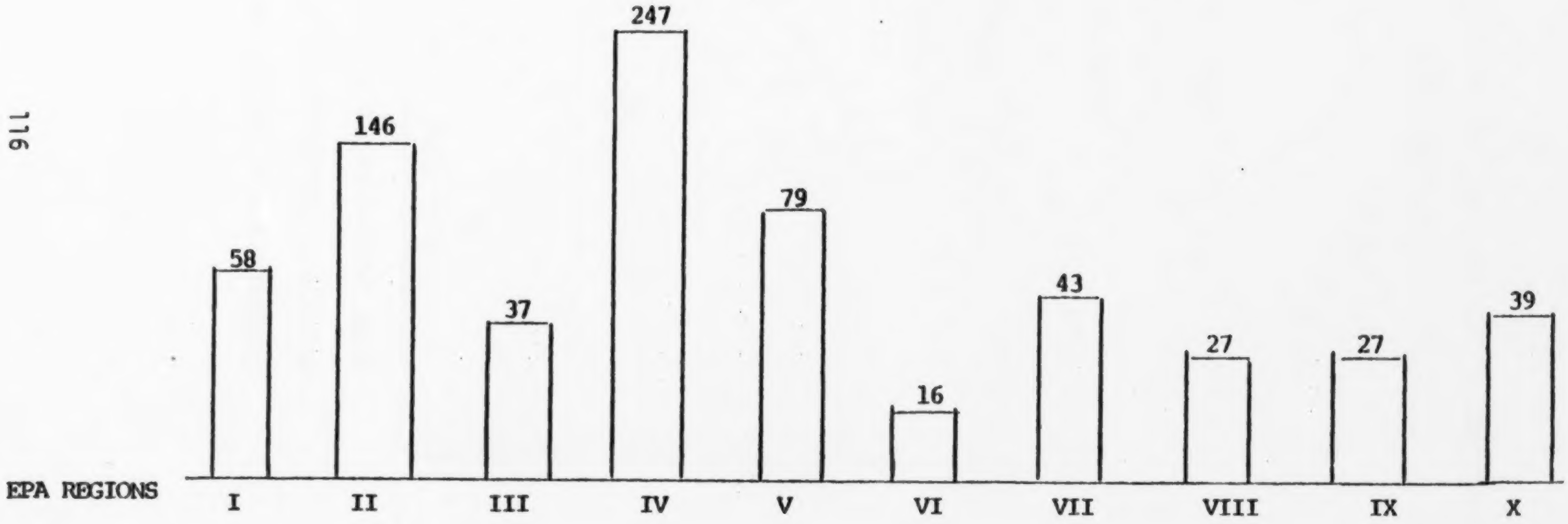
TOTAL FORMAL
ENFORCEMENT
ACTIONS OVER
9 MONTHS: 719

STATE IMPLEMENTATION PLANS (SIP)----------695
NEW SOURCE PERFORMANCE STANDARDS (NSPS)------17
HAZARDOUS AIR POLLUTANTS (NESHAPS)----------7

TABLE IX-3. STATIONARY SOURCE AIR ENFORCEMENT ACTIONS

INITIATED BY EPA REGIONS

JANUARY 1, 1976 - SEPTEMBER 30, 1976



Overall Reduction in Pollutant Emissions -- A 1976 study for EPA shows that industry compliance with local, state, and Federal air pollution control requirements over the period 1970 through 1975 resulted in 22.4 million tons per year of particulates and 7.4 million tons of SO_x being controlled that were not controlled when the Clean Air Act amendments passed in 1970. These reductions in emissions from stationary sources represent achievement of about three-quarters of the reduction goal to be reached under full compliance with existing SIPs for particulates and about one-half of the goal for sulfur oxides.

The Task Ahead -- The 1,450 Class A sources (7 percent) which still violate emission standards or compliance schedules and the 271 Class A sources whose operations must yet be inspected to determine their compliance status constituted the highest priority task outstanding at year's end. These sources rank among the most difficult to bring into compliance because they are, for the most part, large sources such as power plants and steel mills which have to date demonstrated considerable reluctance to make the necessary commitments to curb their emissions to the atmosphere. Thus, despite decided progress in SIP enforcement, state and Federal work with respect to large-source compliance is not yet completed.

Most of the remaining major violators and most of the major sources of unknown compliance status are located in Air Quality Control Regions which are not expected to attain the primary (health-related) National Ambient Air Quality Standards in a timely way, making enforcement against such sources a priority of paramount importance.

In addition, it is estimated that about 130,000 smaller emitters (each having potential emissions of between 10 and 100 tons per year) are located in these areas where standards are not expected to be met.

States and EPA are now conducting extensive analyses to determine the reasons for poor air quality in each of the non-attainment areas of the country and will specifically identify for each AQCR those major and minor sources which are contributing to non-attainment problems. Preliminary analysis indicates that the minor sources making the largest contributions to air quality problems include such stationary sources as small industrial, commercial, and residential boilers; small incinerators, such as apartment house incinerators; dry-cleaning operations; bulk storage tanks; cement handling equipment; cotton gins; feed and grain mills; and chemical plants. As the causes of non-attainment are identified in these complex analyses and as the problem categories of sources are pinpointed, strategies will be devised and followed to bring violating sources into compliance and SIPs will be revised to ensure that appropriate emission limitations are in effect so that the required ambient levels can be attained.

Problem Major Source Categories Regulated Under Section 110

Several categories of major sources are still posing substantial problems across the nation by not achieving compliance with emission standards within the time limits prescribed by the Act. Notable among these sources are coal- and oil-fired power plants, integrated iron and steel manufacturing plants and coking facilities, and primary smelters. EPA has undertaken special efforts to achieve compliance by these sources and continues to bring pressure to bear on the owners and operators of these plants to reduce their pollutant emissions to levels specified in the relevant emission limitations.

In general, these three source categories have the most difficult air compliance problem because of the amount of control required and the associated costs of the control techniques needing application. For power plants, control of sulfur dioxide emissions is the major concern. Flue gas desulfurization systems (scrubbers) and low-sulfur fuels are two major approaches to the reduction of power plant emissions. On the other hand, control of fugitive particulate emissions is the most difficult problem for iron and steel mills and coke plants. This problem is underscored by the large degree of non-compliance at coking facilities. For primary copper, lead, and zinc smelters, control of sulfur dioxide emissions is a major difficulty; plants producing sulfuric acid are commonly required to remove the sulfur dioxide from stack gases. These industries accounted for about one-third of the total emissions of particulates and over two-thirds of the total emissions of sulfur dioxide in 1975. For this reason, compliance by all of these sources is crucial to the attainment of the ambient air quality standards in many AQCRs.

Power Plants -- Control of emissions from power plants is essential to the attainment and maintenance of the health-related ambient air quality standards for sulfur oxides and particulate matter. As a class, the 688 large coal- and oil-fired plants in the U.S. emit nearly 60% of the total national emissions of sulfur oxides and are heavy contributors to ambient particulate loadings.

In the fall of 1973, it became increasingly apparent to EPA that progress to meet applicable state SO_x emission limitations by this sector of industry was lagging severely. At that time more than 70% of the coal- and oil-fired capacity in the nation was being operated in violation of applicable SIP emission limitations, supplies of low-sulfur coal appeared insufficient to assure nationwide compliance with SO_x regulations, and utilities were extremely reluctant to use flue gas desulfurization (FGD) to remove SO_x from stack emissions while burning high-sulfur fuels. National public hearings were held to investigate the utilities' compliance problems.

The hearing panel concluded that the basic technological problems associated with FGD had been solved or were within the scope of current engineering and that FGD could be applied at a reasonable cost. At that time 44 such systems were installed, under construction, or planned around the country. In less than 3 years, Federal and state enforcement pressure has brought this total to 116 plants, 30 of which are operational, 21 of which are under construction, and 65 of which are in various stages of planning. These units total nearly 44,000 megawatts of generating capacity, representing about 50% of the estimated FGD-controlled capacity needed to achieve full compliance with SO_x regulations by 1980.

This increase in applications of FGD systems and a concurrent increase in the use of low-sulfur coal has considerably improved compliance levels for SO_x. About 59% of the nation's coal- and oil-fired capacity is now operating in full compliance with SIP SO_x limitations or is meeting Federally enforceable schedules. About 13% is operating in violation and the compliance status of the remaining 28% is now being reviewed. Many of these violators and those of unknown status are located in Ohio where a new SIP for SO_x was recently promulgated and where a suit was immediately filed under §307 of the Clean Air Act. In addition, a generating capacity of 64,700 megawatts is not currently regulated due to pending SIP revisions for SO_x in Indiana and for both SO_x and particulate matter in Illinois.

The compliance picture is better for particulate matter. A total of 82% of the coal- and oil-fired capacity is meeting emission limitations or complying with schedules to meet these regulations, 16% is out of compliance or violating compliance schedules, and another 2% is of unknown compliance status. However, 8% of the capacity listed as in compliance is not now subject to applicable emission limitations. These plants may soon be subject to control requirements and will then require considerable compliance efforts.

Despite the positive accomplishments which have been made in obtaining compliance from the utility industry, several problems still exist. SIP revisions have yet to be finalized in Illinois and Indiana, and the plan recently promulgated in Ohio is still under challenge. This affects enforcement against 98 plants in these three states alone.

It is expected that court actions will be necessary to resolve some of the outstanding issues surrounding power plant compliance, but the fundamental problems of low-sulfur coal shortages and a lack of confidence in applying FGD technology are now resolved. The utility industry's attitude toward compliance is much improved over that existing three years ago. EPA and states are now actively involved in developing solutions to those remaining problems posed by a number of recalcitrant power plants.

Primary Non-Ferrous Smelters -- Though small in number, the nation's 27 primary copper, lead, and zinc smelters account for about 10 percent of the total sulfur oxides emitted by stationary sources. About one-half of these smelters are located in states where the attainment dates have been extended to mid-1977. Eight smelters are now in compliance with applicable regulations or are on schedules to achieve compliance. Four smelters are now operating in violation of SIP emission limitations for SO_x or are of unknown compliance status. These sources are currently subject to enforcement actions. Of the remaining sources, 13 are located in states having inadequate SO_x plans and two are in areas where no SO_x regulation is needed. Enforcement efforts are now centering on developing adequate plans where needed and on pursuing compliance plans with violators.

SIP regulations require application of reasonably available retrofit control technology and, if necessary, allow the interim use of Supplementary Control Systems (SCS) and tall stacks until adequate constant emission control techniques become reasonably available. Each smelter using SCS is further required to conduct a research and development program to hasten the development of such technology.

Iron and Steel Mills/Coke Plants -- There are 214 steel- and coke-producing facilities in the U.S., most of which are located in areas of the country where the primary health-related ambient air quality standards for particulate matter have yet to be attained. The major air pollution sources within these 214 installations consist of 1,005 processes which convert raw materials into steel (by-product coke batteries, blast furnaces, sinter lines, open hearth furnaces, basic oxygen furnaces, and electric arc furnaces). During the past 18 months, EPA's enforcement program has devoted special emphasis to these major polluting processes. As of July 1976, EPA had taken 99 enforcement actions against these sources (58 formal notices of violation and 41 administrative orders and referrals to the Department of Justice for prosecution).

Compliance in the steel industry still lags far behind most other stationary sources. In September 1976, 483 (48%) of the major steel air pollution sources had yet to achieve full compliance with emission limits established under Section 110 of the Clean Air Act compared to a level of 14% for the nearly 22,000 total Class A sources. To date, state and EPA enforcement efforts have placed 298 (61%) of the 483 violating steel processes on schedule to achieve compliance, a level comparable to all Class A sources where schedules for 1,845 (60%) of the 3,071 Class A violators have been established. Table IX-4 compares the compliance status of the major steel processes with all stationary sources. However, major progress has occurred,

Table IX.4. STATUS OF COMPLIANCE WITH EMISSION LIMITATIONS
MAJOR POLLUTION STEEL PROCESSES VS ALL MAJOR STATIONARY SOURCE INSTALLATIONS
SEPTEMBER 1976

Major Steel Processes	Total Number	Status of Compliance with SIP Emission Limits		
		In Compliance	In Violation	Unknown Status
Coke batteries	230	36	183	11
Sinter lines	57	23	33	1
Blast furnaces	195	127	65	3
Open hearth furnaces	143	48	84	11
Basic oxygen furnaces	68	30	33	5
Electric arc furnaces	312	194	85	33
Totals	1,005	458 (46%)	483 (48%)	64 (6%)
All Class A Installations[a]	21,731	18,466 (85%)	2,994 (14%)	271 (1%)

[a] This comparison shows the compliance status of the steel industry in the most favorable light, since the compliance status of individual processes within steel facilities is being compared to the status of total installations with major potential air pollution problems (the source of the stationary source compliance figures is the EPA formal reporting system; under this system a facility having several processes, only one of which is in violation or of unknown status, must be classified as in violation or unknown as a whole).

especially in the last year. As an example, control of pushing operations (a major source of fugitive emissions at coke batteries) has increased steadily so that the number of plants with at least one battery equipped with a pushing emission control device has risen from less than 3 in 1972 to nearly 20 at the present time. Acceptance of pushing control technology as well as widespread adoption of stage charging and other control practices has given the control program substantial momentum.

Although reasons for continued violations at any major steel mill are complex and related to unique local conditions, the steel industry has regularly raised a number of issues to argue for more time or for relaxation of air pollution requirements.

Impact of Fugitive Process Emissions -- Fugitive process emissions are pollutants formed during an industrial process which escape to the air without having been ducted to a smoke stack. Characteristically, fugitive process emissions are emitted from portions of the steel making operations which are difficult to seal or enclose. The steel industry regularly argues that fugitive process emissions are insignificant in terms of air quality impact. However, evidence from a number of completed and in-process studies shows that, while difficult to measure because not confined, fugitive process emissions have a major environmental impact and can be large in terms of mass emissions.

Economic Impact -- In general, the steel industry has made a variety of arguments that the cost of controlling air pollution (especially control of fugitive emissions) far exceeds any benefits. However, it must be recognized that nearly all major U.S. steel mills were established prior to World War II and many continue to operate older, less profitable equipment. Therefore, regardless of pollution control costs, profits for the steel industry are among the lowest for principal U. S. manufacturing industries (typically 5% to 10% of net worth). In many instances, a better alternative to the controlling of old, less efficient existing facilities is the construction of new, better controlled and more productive replacement facilities.

Energy Issues -- The steel industry contends that the large amount of energy needed to abate air pollution conflicts with national energy policy. In general, EPA has found that the industry estimates of energy needs are exaggerated, based on the application of the most energy-intensive control techniques and not considering the recycling of energy.

Control Feasibility -- The steel industry contends that technology for control of air pollution (especially fugitive emissions) is not available to meet many emission limitations. Pressure by state and EPA enforcement programs over the past five years, however, has shown that institution of improved management procedures and application of existing control technologies can achieve compliance. In addition, research by both EPA and the industry into new pollution control technologies has been greatly stimulated and a number of new, less expensive control techniques are under development.

United States vs Allied Chemical Corporation (Semet-Solvay Division)

On October 29, 1976, sentence was imposed in a major criminal action brought pursuant to Section 113 of the Clean Air Act (42 U.S.C. 1857c-8) for violations of an EPA order requiring source compliance with a State Implementation Plan. The criminal information initiating *United States vs Allied Chemical Corporation (Semet-Solvay Division)*, Criminal No. 76-14 (E.D. Ky., filed June 10, 1976), alleged 88 violations, occurring on 37 separate days, of an administrative order issued on February 12, 1975 by EPA's Region IV Office under Section 113 of the Clean Air Act. The EPA order included compliance schedules for the defendant's two coke batteries at Ashland, Kentucky designed to bring these facilities into compliance with the requirements of the State of Kentucky's implementation plan. Allied entered a plea of nolo contendere to the criminal information on September 9, 1976. Allied was fined $925,000 for the 37 days its Ashland plant was cited for violations of the order.

Thus, while numerous violations from various processes are still occurring at most steel mills, many of these violations are currently the subject of EPA and state enforcement actions. Compliance by 31 of the largest integrated mills and major coke plants is of particular importance due to their large actual and potential impact on air quality. Enforcement of SIP requirements at 31 major plants has resulted in two successful civil/criminal prosecutions to obtain compliance and nine Federally enforceable consent agreements or administrative orders; in addition, source owners for 18 of these plants are now negotiating compliance programs with EPA and state agencies and two plants are the principal subjects of SIP revisions. EPA is also conducting several in-house and contractual studies on control technologies and cost factors as aids in resolving some of the areas of conflict with this industry when negotiating compliance plans.

Section 111 -- New Source Performance Standards (NSPS)

By September 1976, the NSPS program had grown to cover 493 new sources in 24 industrial categories and a national compliance level of approximately 92% had been achieved. In accomplishing this objective, EPA initiated 17 enforcement actions in 1976.

As additional new source categories receive regulatory coverage and as additional sources now under construction commence operations, the NSPS program will assume increasing relative importance within the framework of attaining and maintaining ambient air quality standards.

To expand resources available for enforcement, EPA is undertaking efforts to delegate enforcement authority to state and local air pollution control agencies. By September 1976, authority to carry out the NSPS program had been officially delegated to 20 state and 18 local agencies and proposals for delegation were being discussed with many others.

Section 112 -- National Emission Standards for Hazardous Air Pollutants (NESHAPS)

By September 1976, EPA had determined that 899 industrial sources are subject to promulgated asbestos, mercury, and beryllium requirements. Ninety-four percent of these sources are in compliance with the standards. About 60 additional sources are subject to the new vinyl chloride regulations. Work is now underway to establish compliance plans for these sources. By September 1976, 14 states and 20 local agencies had requested and were delegated enforcement authority for NESHAPS.

Section 119 -- Energy Related Authority

The Energy Supply and Environmental Coordination Act (ESECA), which became law in 1974, mandated the implementation of a national program to conserve petroleum products and increase the use of coal by major fuel consumers. The Federal Energy Administration (FEA) is directed to prohibit certain power plants and authorized to prohibit certain other major fuel burning installations from burning natural gas or petroluem products as a primary energy source. Such prohibitions effectively mandate the use of coal.

For any plant which has received an FEA prohibition order, Section 119 of the Clean Air Act, as amended (Section 3 of ESECA), requires EPA to: (1) notify FEA that the source will be able to burn coal and comply with all applicable air pollution requirements without a Compliance Date Extension (CDE), or (2) in the absence of such a notification, certify to FEA the earliest date by which the source will be able to burn coal and comply with air pollution requirements. (If a source is ineligible for a CDE, EPA must still certify to FEA the earliest date such source can comply with air pollution requirements.) FEA cannot make its prohibition order effective any earlier than the date certified by EPA.

On June 30, 1975, FEA issued prohibition orders to 74 generating units at 32 utilities. As of February 1, 1977, EPA has (1) notified FEA that 11 units could burn coal and comply with all applicable air pollution requirements without a CDE, (2) certified to FEA that 34 units require upgrading of existing air pollution control equipment or installation of new equipment before burning coal, and (3) issued CDEs to 20 units. Action on 4 units has been postponed pending revision of the applicable state implementation plan and action on 5 additional units will be completed shortly. Thus, EPA has completed action on 65 of the 74 units issued prohibition orders.

MOBILE SOURCE ENFORCEMENT

The Mobile Source Enforcement program is directed primarily toward achieving compliance with vehicle emission standards, fuel regulations, and mobile source related aspects of state implementation plans promulgated by EPA under the Clean Air Act. The activities of the program include preventing introduction of uncertified new domestic and imported vehicles into commerce; auditing certification procedures of domestic and foreign automobile manufacturers; enforcing vehicle assembly line emission test activity and the recall, warranty, anti-tampering, and imports provisions of the Act; developing and enforcing Federal regulations for the removal of lead from gasoline; and ensuring compliance with transportation control plans, mobile source related vapor recovery regulations, and inspection and maintenance programs.

Inspection/Investigation Program

Section 206(c) of the Clean Air Act authorizes the enforcement activities related to emission requirements for "new" motor vehicles or engines - i.e., motor vehicles or engines which have not yet been sold to the ultimate purchaser. This authority includes right of entry for the purpose of conducting tests of vehicles in the hands of the manufacturer and for inspecting records and facilities used by the manufacturer in complying with the Act and regulations thereunder. Section 208 of the Act authorizes written inquiries by the Agency in order to determine whether a manufacturer is or has been acting in accordance with the Act and regulations thereunder.

Since January 1, 1976, mobile source enforcement personnel have conducted 62 inspections of domestic and foreign motor vehicle manufacturers. Such inspections include detailed audits of procedures and records and visual inspection of facilities and vehicles in order to determine whether manufacturers are and have been acting in compliance with the Clean Air Act and its regulations.

A total of seven vehicle manufacturer investigations have been conducted since January 1, 1976, some of which arose from inspections. These investigations consist of a search of vehicle manufacturer records and documents and interrogation of individuals to determine whether violations of the Clean Air Act and its regulations have occurred. Issuance of requests for production of information pursuant to Section 208 of the Act frequently accompany such investigations and such requests include requiring the manufacturer to develop emission test data where violations may be accompanied by effects on emission performance. Since January 1, 1976, twelve Section 208 letters have been issued.

Out of the seven investigations, one case was referred to the Department of Justice for legal action. That referral dealt with Chrysler Corporation's introduction into commerce of 9,185 vehicles which were not covered by a certificate of conformity.

Selective Enforcement Audit Program

On July 28, 1976, regulations were published establishing a program for testing new production vehicles at the assembly line in order to assure that they comply with emission standards. The program is called Selective Enforcement Auditing (SEA) and involves the testing, pursuant to an administrative order and in accordance with the Federal Test Procedure, of a statistically representative sample of production vehicles from a specified configuration. If nonconformity is established, EPA may suspend or revoke the certificate of conformity.

The SEA program is being run on a trial basis until December 31, 1976. Test orders are being issued but no enforcement sanctions will be imposed as the result of vehicles failing to meet emission standards. One trial audit each will be run for American Motors, Chrysler, Ford, and General Motors.

Starting January 1, 1977, the SEA regulations became fully effective. Two audit teams will be utilized to conduct a total of twenty audits for model year 1977.

Recall Program

Section 207(c) of the Clean Air Act authorizes EPA to order recall of vehicles if they do not conform to emission standards. Since January 1, 1976, EPA has initiated 28 recall investigations. Thus far in 1976, as a result of EPA investigations, manufacturers have initiated recalls on approximately 620,000 vehicles. These recalls are being monitored by EPA.

Warranties and Aftermarkets Parts Program

The warranty provisions of the Clean Air Act are designed to help assure that manufacturers develop and produce vehicles that meet emission standards throughout their useful lives. The production warranty provision in Section 207(a) of the Clean Air Act requires that the manufacturers warrant that the vehicle or engine meets applicable emission standards at the time of sale and is free from defects which, during the useful life, may cause the vehicle or engine to fail to comply with the emission standards.

Although this provision has been in effect since the 1972 model year, it has proved of little utility to consumers experiencing difficulties with their vehicle's emission control system. The Agency believes that this is because consumers do not know with any precision what components and failures are covered by the Section 207(a) warranty and, when they do make claims, are unable to sustain the burden of establishing that the failure is indeed a defect causing the emissions to exceed Federal standards, as Section 207(a) is generally interpreted to require. To overcome these difficulties and to make Section 207(a) useful to consumers with legitimate claims, the Agency intends ultimately to promulgate regulations defining the coverage of this provision. To provide technical support for this program, the relationship of defective vehicle components to emissions is being investigated under contract. EPA also has continued to review owner's manuals to see that the Section 207(a) warranty is provided to consumers in language which adequately reflects the statutory intent.

The performance warranty provision in Section 207(b) of the Clean Air Act, when implemented, will require a manufacturer to warrant that properly maintained and used vehicles and engines comply throughout their useful lives with emission standards when in actual use. This provision has not been implemented because of the technical difficulty of identifying relatively quick and inexpensive emission tests which "are reasonably capable of being correlated" with the sophisticated test used on prototype vehicles, as Section 207(b) requires. Major activities in this area since January 1, 1976, include the drafting of proposed test procedures and warranty regulations for publication in the Federal Register early in 1977.

Anti-tampering Program

Section 203(a)(3) makes it a prohibited act for any manufacturer or dealer to knowingly remove or render inoperative a vehicle's emission control system after sale of the vehicle to the ultimate purchaser. From January 1, 1976, approximately 25 tampering inspections and interviews have been conducted. Six cases were referred to the Department of Justice for action. At least eight other cases are being processed for referral to the Department of Justice. To date, nine tampering cases have been successfully prosecuted, resulting in civil penalties totaling $9,000.

Imports Program

Sections 203(a)(1) and 203(b)(2) give EPA responsibility for enforcing compliance of imported motor vehicles with emission standards. In conjunction with the Bureau of Customs, EPA has monitored importation of an estimated 2-1/2 million commercial and privately owned vehicles since January 1, 1976. Through that program, 1,200 noncomplying vehicles imported under bond have been modified pursuant to administrative orders. In addition, 75 nonconforming vehicles have been exported pursuant to administrative orders. Penalties totaling $760,000 have been assessed through Customs for noncompliance with the regulations.

EPA has conducted 33 investigations of alleged illegal importations. One case was referred to the Justice Department for prosecution.

Fuels Enforcement Program

EPA has responsibility for enforcing Section 211(c)(1) of the Clean Air Act relating to the regulation of fuels and fuel additives. On January 10, 1974, EPA promulgated regulations requiring the general availability of unleaded gasoline by July 1, 1974, for use in 1975 and later model cars equipped with catalytic emission control systems.

EPA has established a nationwide Fuels Enforcement Program for ensuring that affected retail outlets are in compliance with these regulations. This program includes sampling of the fuel at retail outlets by Regional EPA Field Inspectors and State Inspectors under EPA contract and the analysis of the samples for lead content.

From January 1, 1976, to September 30, 1976, EPA has conducted approximately 23,400 inspections of service stations to ensure compliance with the unleaded fuel regulations. At the stations, 20,800 gasoline samples were taken, of which about 1.35% were found to be contaminated with lead. Approximately 3,500 minor violations were also found during this period. Enforcement has issued approximately 3,125 warnings and 536 complaints and has collected $186,325 in penalties during this period.

Lead Phasedown Program

On December 6, 1973 (38 FR 33734), the EPA issued regulations pursuant to Section 211 of the Clean Air Act controlling the amount of lead additives used in gasoline. The original lead reduction schedule limited the average amount of lead in gasoline to a maximum of 1.4 grams per gallon (gpg) in

1976, 1.0 gpg in 1977, 0.8 gpg in 1978, and finally to 0.5 gpg by January 1, 1979. These regulations were upheld by the Court of Appeals for the District of Columbia Circuit in March 1976.

Because of studies indicating that gasoline shortages would result if the original schedule were enforced, EPA amended the regulations in September 1976. The amended regulations retain the 0.5 gram per gallon standard, but extend the period for compliance with that standard from January 1 to October 1, 1979, in order to permit sufficient time for refiners to install the equipment necessary to meet the reduced lead level without causing a gasoline shortage. The January 1, 1978, standard of 0.8 gram per gallon also remains in effect but will be suspended if a refiner can show that he has taken, and is continuing to take, sufficient actions in procuring and installing equipment to ensure the achievement of the 0.5 gram per gallon standard by October 1979 or before. Separate treatment of small refiners (30,000 barrels per calendar day or less crude oil capacity) with regard to the final lead level requirement is under active consideration.

Inspection/Maintenance and Transportation Control Measures

During the past year, EPA has made efforts to assure the implementation of state inspection/maintenance programs and transportation control measures. Establishment of these programs will reduce emissions from vehicles in-use and will help assure that NAAQS for carbon monoxide and photochemical oxidants are achieved in certain AQCRs.

While Title I gives EPA the authority to ensure enforcement of inspection/maintenance and of Transportation Control Plans, recent Circuit Court decisions relating to enforcement of these measures have taken differing views regarding the scope of EPA's authority to take enforcement actions directed at governmental bodies for failure to implement inspection/

maintenance programs and other transportation control related strategies. This issue is now before the Supreme Court for final resolution. The courts have, however, unanimously upheld EPA's authority to take enforcement actions against individual sources.

Stage I Vapor Recovery

Regulations requiring the control of vapors emitted during transfer operations in the gasoline marketing chain have been promulgated under Section 110 of the Clean Air Act. Stage I involves the recovering of vapor emitted during the filling of delivery trucks and the subsequent filling of underground storage tanks. EPA has promulgated Stage I vapor recovery regulations in 13 air quality control regions.

The final compliance date in most areas was March 1, 1976. In some cases, this date has been extended until May 31, 1977. EPA Regional Offices and state and local offices are now beginning a field compliance monitoring program.

Stage II Vapor Recovery

Regulations to control gasoline vapors during vehicle refueling, Stage II vapor recovery regulations, were promulgated in the original State Implementation Plans, under Section 110 of the Clean Air Act, in late 1973 and early 1974. These regulations specified that 90% of gasoline vapors emitted during vehicle refueling must be recovered, but did not include a test procedure for evaluating a system's performance. In October 1975, revisions were proposed to the regulations. The revisions included establishing a mass emission standard rather than the 90% recovery requirement and proposed several test procedures to determine whether a system complies with the standard.

During the past year, the Office of Enforcement developed a short test that could be used to test the performance of Stage II equipment in the field. Based on the development of this test, the Stage II vapor recovery regulations were reproposed in November 1976. The new proposal abandons the earlier system certification approach and adopts in-use field enforcement as the primary means for assuring compliance with the regulatory requirements. The new proposal also allows small marketers more time than the major oil companies to meet the regulatory requirements.

Table IX-5 summarizes mobile source enforcement activities for the period from January 1, 1976, to September 30, 1976.

FEDERAL PROCUREMENT AND THE LIST OF VIOLATING FACILITIES

Legal Authority and Background

Section 306, "Federal Procurement," was designed to utilize the Federal contract, grant, and loan processes as a means of encouraging compliance with the Clean Air Act. Section 306(a) prohibits any Federal agency from entering into contracts to be performed at any facility giving rise to a criminal conviction under Section 113 of the Act. Section 306(c) empowers the President to issue an Executive Order requiring each Federal Agency to use the contract, grant, and loan processes to implement these provisions of the Act and to set forth procedures, sanctions, penalties, and such other provisions as the President determines necessary to carry out the section. Section 306(d) empowers the President to exempt any contract, loan, or grant from the provisions of the section on the basis of paramount national interest. This section is comparable to the language of Section 508 of the Federal Water Pollution Control Act of 1972, as amended (33 U.S.C. 1251 *et seq*).

Executive Order 11738 was issued on September 10, 1973. The Order implemented Section 306 of the Air Act and Section 508 of the Water Act. On April 16, 1975, EPA promulgated regulations providing for the establishment

Table IX-5 MOBILE SOURCE ENFORCEMENT

January 1, 1976 through September 30, 1976

(By Category)

PROGRAM AREA	ACTIVITIES/ACTIONS/RESULTS	
Inspection/Investigation of Auto Manufacturers	62 Inspections 20 Foreign 42 Domestic	1 Prosecution Referral
	7 Investigations	12 Section 208 Letters
Tampering	25 Investigations	5 Prosecution Referrals $350 Civil Penalties
Recall	28 Investigations 12 Manufacturer Initiated Recalls	620,000 Vehicles
Imports	33 Investigations	1 Prosecution Referral 1,200 Vehicles Modified 75 Vehicles Exported $760,000 Civil Penalties Assessed
Fuels	23,400 Service Station Inspections 20,800 Gasoline Samples Analyzed 3,125 Warnings Issued	536 Complaints Filed $186,325 Civil Penalties
TCP/ I/M	6 On-going I/M Programs 46 Section 114 Letters Sent to Employers	1 Prosecution Referral 2 Orders Issued

of a List of Violating Facilities which will show those facilities ineligible for use in a Federal contract, grant, or loan.

The most controversial issue surrounding the regulations concerned whether EPA had the legal authority to go beyond a Federal criminal conviction as a potential basis for listing a facility. Pursuant to Section 306(c) of the Clean Air Act and sections 1, 4, 5, and 7 of the Executive Order, EPA has taken the position that it has such authority. This position was upheld in a challenge to the regulations in a water case.

Description of Program

The program established in the regulations published on April 16, 1975, affects contract, grant, and loan activities of all Federal agencies as of July 1, 1975. It is facility-oriented, not company-oriented, so that only the specific facilities placed on the EPA list will be ineligible for use in a Federal contract, grant, or loan. Facilities will be listed upon a determination by EPA of continuing or recurring noncompliance with clean air (or water) standards. However, Federal criminal convictions require an automatic listing. When Federal criminal conviction is the basis for listing, removal will not occur until the Administrator certifies that the condition which gave rise to the conviction has been completely corrected. State and local criminal convictions and Federal, state, or local civil adjudications or administrative findings that such facility is in noncompliance with clean air (or water) standards also may serve as a basis for listing. In those cases removal from the list will not occur until EPA enters into an approved plan of compliance which will ensure that the condition which gave rise to the listing will be corrected. In cases where a facility has been subject to state or local civil adjudications or administrative findings, EPA shall only consider listing at the request of the Governor.

The program applies to any contract, subcontract, grant, subgrant, loan, or subloan in excess of $100,000 as well as to any contract of a lesser amount involving a facility listed on the basis of a Federal criminal conviction.

In order to ensure due process, no facility will be listed until its representatives have been afforded an opportunity to confer and present information to the Director, Office of Federal Activities, EPA (this is called a Listing Proceeding). If, in turn, a request to be removed from the list is denied, representatives of the facility will be afforded a hearing before an EPA hearing officer with fair opportunity to present evidence and to cross-examine. Regulations governing these hearings will be published in 1977.

It must be emphasized that the program is an additional arm of the EPA enforcement effort and is primarily designed to encourage voluntary compliance and not to penalize a facility. To this end, the possibility of listing has been raised early in compliance negotiations in many cases, and it appears that the potential listing of a violator has had substantial effect on the companies' decisions to come into compliance rather than enter into litigation.

Implementation Within the Federal Establishment

Pursuant to Section 4 of the Executive Order, each Agency of the Executive Branch is obligated to implement the listing program through its contract, grant, and loan activities. Implementation involves amending the Federal Procurement Regulations (FPR), the Armed Services Procurement Regulations (ASPR), and any supplemental or comparable regulations as well as close coordination with EPA to ensure that requirements of the program are fully carried out. The ASPR, FPR (which guides civilian agencies), and NASA and ERDA procurement regulations have been amended. Also, agency grant and loan provisions have been amended.

EPA publishes the List of Violating Facilities periodically in the Federal Register. The first facilities - Del Monte de Puerto Rico, Inc., Star-Kist Caribe, Inc., and Allied Chemical, Semet-Solvay Division, Ashland, Kentucky, were listed by December 1976. Facilities are being listed both on the basis of administrative determination of non-compliance by EPA and pursuant to a criminal conviction under the Clean Air Act. In addition, contact points within each Federal agency have been identified to receive EPA's List of Violating Facilities every time a new facility is added to ensure prompt implementation.

Under the contract provisions each bidder must certify when bidding on a particular contract that he is not on EPA's List of Violating Facilities and that he will promptly notify the contract officer of the receipt of communication that he is under consideration for listing. If a particular basis for listing has been identified against a facility but the facility is not on the EPA list, the Director, Office of Federal Activities, EPA, may request that an award of a particular contract be withheld for a period not exceeding 15 days pending completion of an investigation.

COMPLIANCE BY FEDERAL FACILITIES

It is the policy of the Federal Government, as expressed in Executive Order 11752 (December 17, 1973), that Federal agencies shall provide leadership in the prevention, control, and abatement of air pollution through the compliance of their facilities with applicable air quality standards and emission limitations. To carry out this mandate, the Order assigns specific responsibilities to the Administrator and the heads of the Federal agencies. The principal duties of the Administrator are to:

1. Issue regulations and guidelines to Federal agencies to expedite compliance with the standards by their facilities;

2. Maintain review of the facilities' compliance; and

3. Coordinate the compliance activities with state and local agencies.

The heads of Federal agencies have the primary responsibility to:

1. Ensure that their facilities comply with the standards;

2. Cooperate with the Administrator and state and local pollution control agencies by providing information needed for independent determinations of the compliance status of the facilities; and

3. Consult with the Administrator and state and local pollution control agencies concerning the best techniques and methods available for air pollution control.

While the Executive Order clearly expresses the policy that Federal facilities are required to comply with substantive standards and limitations, it also states that it is not the policy of the Executive Branch to require Federal facilities to comply with state and local administrative procedures with respect to pollution control. The legality of this distinction between substantive standards and procedural requirements has been upheld by the Supreme Court. (See Chapter X - "Litigation")

X. LITIGATION IN 1976

TRANSPORTATION CONTROL PLANS

As reported in last year's report, the U.S. Court of Appeals for the Third Circuit held in 1974 that EPA may require states to implement programs to reduce pollution from private vehicles using public roads.[1] In 1975 the Fourth and Ninth Circuits took a different position, holding that an attempt to make a state administer and enforce programs to control pollution by its citizens is not authorized by the Act and may be unconstitutional.[2] Finally, the D.C. Circuit held that EPA may compel states to implement some transportation control measures but not others.[3] The three 1975 decisions have been appealed to the Supreme Court in the 1976 term by EPA, several states, and an environmental group. The Court is expected to rule on them this term.

In a 1976 case, the Second Circuit affirmed the right of citizens to sue a state or local government for compliance with transportation control measures and other SIP requirements.[4] In this case, the transportation control measures had been adopted by the state, rather than promulgated by EPA, and the Court did not address the constitutionality of the measures. A subsequent District Court opinion held on statutory grounds that certain portions of the measures in question were unenforceable,[5] but that decision has now been reversed by the Second Circuit, which ordered prompt enforcement of the measures in question.

LEAD POLLUTION

Last year's annual report noted that EPA's lead additive regulations were invalidated by a 2-1 vote of a panel of the D.C. Circuit. In 1976, the full Court upheld the regulation, holding that there was sufficient scientific evidence for EPA to conclude that lead emissions from motor vehicles endanger public health.[6] On June 14, 1976, the U.S. Supreme Court declined to review the case. The Court of Appeals recognized that many of the public health decisions before EPA "are on the frontiers of scientific knowledge" and said that to require absolute certainty of harm before EPA can act would frustrate EPA's ability to protect the public health and the environment. The Court, therefore, held that in circumstances where certainty was not possible, EPA may properly base its regulatory decisions on prudent policy judgments where factual analysis cannot provide definite answers.

In another decision related to lead pollution, the Second Circuit upheld[7] a lower court decision[8] ordering EPA to place lead on the list of air pollutants which are regulated under the implementation plan approach. The Court held that since the Administrator had found that lead is present in the ambient air resulting from numerous and diverse sources and has an adverse effect on public health or welfare, he is required to publish air quality criteria and standards for it and could not choose to use exclusively other regulatory authorities of the Act.

NEW SOURCE PERFORMANCE STANDARDS

The courts have continued to uphold new source performance standards promulgated by EPA under Section 111 of the Clean Air Act. The standard for asphalt concrete plants was affirmed by the D.C. Circuit, which also held that the public is entitled to notice and opportunity for comment on EPA's initial decision that a category of sources is a significant contributor to air pollution to warrant regulation pursuant to Section 111.[9]

PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

EPA promulgated regulations for PSD in December 1974. The PSD regulations are designed to protect air which is cleaner than the minimum ambient standards in many areas of the country. The PSD regulations were challenged in Court by many parties, including both industrial and environmental groups. In August 1976, the U.S. Court of Appeals for the District of Columbia Circuit upheld the PSD regulations against arguments that they were unauthorized and arguments that they were not sufficiently stringent.[10] Petitions for *certiorari* are currently pending in the Supreme Court.

STATE CONTROL OVER FEDERALLY-OWNED POLLUTION SOURCES

Section 118 of the Clean Air Act requires Federal facilities to comply with state air pollution laws. Settling a conflict among lower courts, the Supreme Court held in June 1976 that Federal facilities only had to comply with state substantive requirements (i.e., emission limitations) and not procedural requirements (i.e., permit procedures) under Section 118 of the Act. The Court said it would be an unusual step to subject Federal facilities to state procedural controls and it could not find congressional intent to do so.

EPA AUTHORITY TO REQUIRE STRINGENT MEASURES TO ACHIEVE HEALTH STANDARDS

The U.S. Court of Appeals for the Ninth Circuit upheld the principle that EPA may promulgate such measures as may be necessary to attain the health-related ambient standards on schedule even if they may be socially or economically disruptive.[11] EPA recently revoked the gasoline-rationing regulations which were the subject of the suit,[12] but the case indicates judicial willingness to treat seriously the legislative demand that the Act's health standards be attained on schedule.

ENFORCEMENT AND ECONOMIC AND TECHNOLOGICAL INFEASIBILITY

During 1976, the Supreme Court, in Union Electric vs EPA,[13] resolved the question whether economic and technological infeasibility is relevant to EPA's review of a state-submitted implementation plan. Acknowledging that the Administrator's sole obligation in reviewing a SIP is to determine whether the eight requirements of § 110 of the Act have been satisfied and that economic and technological feasibility are not among those requirements, the Court held that "claims of economic and technological infeasibility ... are wholly foreign to the Administrator's consideration of a state implementation plan" and that "the Administrator must approve a Plan that attains the primary standards in three years even if attainment does not appear feasible."

While in Union Electric, the Supreme Court did not address the issue whether infeasibility claims may be raised in Federal district court in defense of an enforcement action, the issue has since arisen in the District Court for the District of Columbia. In Friends of the Earth vs Pepco,[14] the Court held that "claims of technological and economic infeasibility [do] not constitute a defense to an adjudication of violation of applicable SIP requirements." However, the Court did go on to say that such claims may be considered by the Court in formulating equitable relief.

In a second District Court decision involving employees of a source scheduled for shutdown pursuant to the terms of an EPA consent decree, intervention by the employees was rejected on the ground that the Court lacked jurisdiction to grant the relief sought by the intervenors, i.e., postponement of the already exceeded compliance date contained in the SIP.[15] The case is under appeal.

PRE-ENFORCEMENT REVIEW

In two court actions involving EPA enforcement orders, pleadings filed by the complainants were dismissed by the respective courts. In Fry Roofing Co. vs EPA,[16] the company sought review of an order issued under authority of Sections 113 and 114 of the Act which required that certain monitoring equipment be installed. The action was dismissed on the ground that it sought pre-enforcement review of the order and that the legislative history of the Act established that such review was impermissible. The decision is being appealed. In Commonwealth of Puerto Rico vs Train,[17] the Commonwealth asked that the Agency be prevented from enforcing a consent decree on the ground that the Plan provisions underlying the consent decree might be revised in the future. Viewing the cause of action as a challenge to the underlying provisions of the Plan, the Court held that it lacked jurisdiction and dismissed the action.

TALL STACKS AND SUPPLEMENTARY CONTROL SYSTEMS

In pre-1975 decisions issued by the Fifth,[18] Sixth,[19] and Ninth[20] Circuit Courts of Appeals, the use of dispersion technology (i.e., tall stacks and supplementary control systems) was rejected as a means of meeting ambient air quality standards. During 1976, a motion for contempt involving the Fifth Circuit case was dismissed[21] and petitions for certiorari filed in conjunction with the Sixth and Ninth Circuit opinions were denied,[22] seemingly putting the issue to rest. However, in November of 1976, a District Court judge in Nevada held that dispersion technology may be used to satisfy ambient air quality standards where constant controls are shown to be economically infeasible.[23] The decision is being appealed.

REFERENCES

1. Pennsylvania vs EPA, 500 F.2d 246 (3rd Cir. 1974).
2. Brown vs EPA, 521 F.2d 827 (9th Cir. 1975); Maryland vs EPA, 530 F.2d 215 (4th Cir. 1975).
3. District of Columbia vs Train, 521 F.2d 971 (D.C. Cir. 1975).
4. Friends of the Earth vs Carey, 535 F.2d 165 (2d Cir. 1976).
5. Friends of the Earth vs Carey, ___ F.Supp. ___, 9 ERC 1007 (S.D.N.Y., July 13, 1976).
6. Ethyl Corp. vs EPA, 541 F.2d 1 (D.C. Cir. 1976).
7. NRDC vs Train, No. 76-6075, ___F.2d ___ (2nd Cir. November 10, 1976).
8. NRDC vs Train, 8 ERC 1695 (S.D.N.Y. March 1, 1976).
9. National Asphalt Pavement Association, et al. vs Train, 539 F.2d 775 (D.C. Cir. 1976).
10. Sierra Club vs EPA, 540 F.2d 1114 (D.C. Cir. 1976).
11. City of Santa Rosa vs EPA, 534 F.2d 150 (9th Cir. 1976).
12. 41 Fed. Reg. 45565, October 15, 1976.
13. ___ U.S. ___, 96 S.Ct. 2518 (1976).
14. ___ F. Supp. ___, 9 ERC 112 (D.D.C., 1976).
15. U.S. vs U.S. Steel, CA 75-H-735-S (D.N.D. Ala., June 23, 1976).
16. 415 F.Supp. 799, D.W.D. Mo. (1976).
17. Civil Action No. 76-958 (D.D.C., June 30, 1976).
18. NRDC vs EPA, 489 F.2d 390 (CA 5, 1974).
19. Big Rivers vs EPA, 523 F.2d 16 (CA 6, 1975).
20. Kennecott Copper vs EPA, 526 F.2d 1149 (CA 9, 1975).
21. 529 F.2d 755 (CA 5, 1976).
22. ___ U.S. ___, April 19, 1976.
23. Kennecott Copper vs Train, Civil LV 76-195 RDF (D.Nev.November 23, 1976).